MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="3">General Geology</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 111</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">125</td></tr>
<tr><td>Module Level</td><td>1</td><td colspan="2">Semester of Delivery</td><td colspan="2">1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Riaed Al-saedi</td><td>e-mail</td><td colspan="3">dr.ra.iraq@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents

Module Aims	This course draws from all fields of geosciences to explore the evolution of Planet Earth. Topics include: an introduction to earth materials (minerals, rocks, soils, and water); Earth's interior structure; geological processes in operation on and beneath the surface of the earth and their effects (weathering, erosion, deformation and geologic structures, earthquakes, plate tectonics).
Module Learning Outcomes	This learning outcome implies that upon completing the geology module, students should have achieved the following: 1- Knowledge of Geological Processes: Students should have a solid understanding of the fundamental processes that shape the Earth, such as plate tectonics, erosion, weathering, and deposition. 2- Understanding of Geological Principles: Students should be familiar with key geological principles, including rock formation and identification, geological time, and the interpretation of geological maps and cross-sections. 3- Application of Geology: Students should be able to apply their knowledge of geology to analyze and interpret geological phenomena, such as the formation of mountains, earthquakes, volcanoes, and the distribution of natural resources. They should also be capable to apply knowledge of topographic maps to quantify geometrical aspects of topography. 4- Critical Thinking and Problem-Solving: Students should develop critical thinking skills and be able to apply geological concepts to solve problems and make informed decisions in both academic and real-world contexts. 5- Communication of Geological Concepts: Students should be able to effectively communicate geological concepts, findings, and interpretations using appropriate scientific terminology and conventions, both in written and oral forms.

Learning and Teaching Strategies	
Strategies	Geology, as a scientific discipline, involves the study of the Earth's structure, composition, history, and processes. The learning and teaching strategies employed in geology often focus on a combination of theoretical knowledge, practical fieldwork, laboratory analysis, and interactive discussions. Here are some common learning and teaching strategies used in geology: Laboratory work: Geology involves various laboratory techniques for analyzing rocks, minerals, and other geological materials. Laboratory work provides hands-on experience in using tools and instruments like microscopes, spectrometers, and chemical analysis equipment. Students learn how to identify minerals, analyze rock formations, and interpret geological data through experiments and sample analysis or from geological maps. Visual aids and multimedia: Geology often relies on visual representations to understand complex concepts. The use of diagrams, maps, charts, and models helps students visualize geological processes, landforms, and structural features. Multimedia resources like videos, animations, and virtual reality (VR) simulations can enhance learning by providing interactive and immersive experiences.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Geology The Earth System and Earth materials. The universe and Planet Earth; Earth composition and Earth structure
Week 2	Earth history and geological time, Relative dating; Absolute age
Week 3	Plate tectonic theory, The Type of Plate margins, Consequences of Plate Tectonics
Week 4	Formation and classification of minerals Physical and chemical properties of Minerals. The mineral groups, Mohr’s Scale

Week 5	Rock cycle and Types of rocks
Week 6	Igneous rock, Classification of Igneous rock Rocks.
Week 7	**Midterm Exam**
Week 8	Sediments and Sedimentary Rocks, Classification of Sedimentary Rocks.
Week 9	Metamorphism and Metamorphic Rocks
Week 10	Weathering and Erosion, Mass Wasting
Week 11	Structural geology. Tectonic and deformation; Folding; Faulting
Week 12	Earth energy and resources. Hydrocarbon; Oil shale and coal; Radioactive; Metals and ores; Non-metallic industrial minerals; Renewable energy
Week 13	Project Discussions
Week 14	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Crystallography (symmetry and crystal systems)
Week 2	Lab 2: Physical Properties of Minerals and Mineral Identification
Week 3	Lab 3: Rock Groups and Rock Properties, Rock Identification
Week 4	Lab 4: Igneous rocks (Identification and classification of igneous rocks)
Week 5	Lab 5: Sedimentary rocks (Identification and classification of sedimentary rocks)
Week 6	Lab 6: Geological map (Topography map (Contour Maps), Profiles, and Gradients)
Week 7	Lab 7: Reading and Interpreting Geological Maps: Identification of rock formations, structures, and geological features.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Physical geology, Plumer Carelson,2020	Yes
Recommended Texts	Edward J. Tarbuck, Frederick K. Latgens (2011), Earth, An Introduction to Physical Geology (10th Edition), Pearson Prentice Hall, USA.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

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<tr><td>Module Title</td><td colspan="3">Democracy and human rights</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Basic</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">UOM 121</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">2</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">50</td></tr>
<tr><td>Module Level</td><td>1</td><td colspan="3">Semester of Delivery</td><td>1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. Code</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Moaed Hassian</td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Assis.Lec.</td><td colspan="3">Module Leader’s Qualification</td><td>Master</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
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<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1-To gain an understanding of the philosophic and political backgrounds that underpin the concept of human rights, enabling students to grasp the multifaceted nature of this complex field. 2-To learn about the significant historical documents that have contributed to the development and formation of human rights theories, enriching their knowledge of the history and evolution of human rights. 3-To engage in critical examination and discussion of current political and ethical debates surrounding human rights, fostering critical thinking and encouraging students to form their own perspectives on these issues. 4-To study key legal documents and understand the work of crucial governmental and non-governmental institutions currently involved in the protection and promotion of human rights. This objective aims to make students aware of the global landscape of human rights protection and how it operates. 5-To undertake a detailed examination of at least one current problem area in human rights protection, providing a practical application of knowledge and giving students a deeper understanding of the complexities and challenges faced in human rights protection. 6-To promote an understanding and appreciation of the importance of human rights in all areas of life, including engineering, highlighting the significance of ethical considerations in technical professions. 7-To encourage students to consider how their future work as engineers could potentially impact human rights, fostering a sense of social responsibility and ethical awareness in their professional practice. 8-To cultivate skills in research, analysis, and argumentation related to human rights, thereby enhancing students' overall academic and intellectual skills.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the historical, philosophical, and political context of human rights, appreciating the complexities and dimensions of the concept. 2- Be familiar with significant historical documents and milestones that have contributed to the evolution of human rights theories and their role in shaping the current understanding of human rights. 3- Analyze and articulate positions on contemporary political and ethical debates about human rights, demonstrating critical thinking skills and a broad understanding of the issues. 4- Identify and understand the roles of major governmental and nongovernmental institutions in the promotion and protection of human rights, demonstrating an awareness of the broader global landscape of human rights advocacy. 5- Analyze a specific, current problem area in human rights protection, applying theoretical knowledge to real-world situations and demonstrating problem- solving

	skills. 6- Appreciate the relevance and importance of human rights considerations within their field of study, electrical engineering, and the broader engineering context. 7- Exhibit an understanding of the ethical responsibilities and potential impacts of engineering projects on human rights, preparing them to consider these factors in their future professional practice. 8- Show competence in researching, analyzing, and articulating arguments related to human rights, demonstrating development in academic skills applicable beyond this specific module. By achieving these learning outcomes, students will have not only a strong foundational understanding of human rights and its relevance to their discipline but also enhanced critical thinking and problem-solving skills.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduces students to the philosophic and political background of the concept of human rights. 2. Discusses important documents as part of the history of the development of human rights theories. 3. Examines important issues in current political and ethical debates about human rights. 4. Reviews core legal documents and the work of the most important governmental and nongovernmental institutions currently involved in human rights protection and promotion. 5. Examines at least one current problem area in human rights protection

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures: Traditional lectures will be used to introduce fundamental concepts, providing students with a strong theoretical foundation in the philosophic and political backgrounds of human rights, the history of human rights theories, and the role of various institutions in human rights protection and promotion. 2. Interactive Discussions: To facilitate critical thinking and engagement, class sessions will often involve interactive discussions. These might revolve around the analysis of important historical documents, current debates on human rights issues, or case studies of specific problem areas in human rights protection. 3. Group Projects: Students will work in groups to analyze a specific problem in

	human rights protection, encouraging teamwork, fostering a deeper understanding of the issue, and enabling students to apply theoretical knowledge to practical scenarios. 4. Guest Lectures: Inviting practitioners from the field, such as human rights activists, legal professionals, or engineers working on ethical issues, can provide students with real-world insights and inspire them to consider the impact of their work on human rights. 5. Research Assignments: Individual or group assignments might require students to conduct research on a specific topic related to human rights. This encourages independent learning, develops research skills, and deepens their understanding of the subject. 6. Case Studies: By analyzing and discussing real-world cases in class, students can understand the practical application of human rights theories, grasp the challenges faced in human rights protection, and consider the relevance of these issues in their own field of study. 7. Online Resources: Making use of online resources, such as academic articles, video lectures, podcasts, or documentaries, can supplement the course material and offer different perspectives on the subject matter. 8. Reflection Papers: Students could write reflection papers on how they see human rights intersecting with their engineering studies and future careers, promoting introspection and ethical awareness. These strategies aim to promote an active learning environment where students can deeply engage with the subject matter, enhancing their understanding and fostering important skills such as critical thinking, teamwork, research, and communication.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	1 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	مدخل عام الى مفهوم حقوق الانسان
Week 2	حقوق الانسان في الحضارات القديمة والشرائع السماوية
Week 3	تطور فكرة حماية حقوق الانسان في العصر الحديث
Week 4	المجتمع الدولي وحقوق الانسان
Week 5	اليات الامم المتحدة لحماية حقوق الانسان
Week 6	واجبات الانسان والقيود الواردة على ممارسة حقوق الانسان
Week 7	المنظمات والهيئات الدولية المعنية بحماية حقوق الانسان
Week 8	اخلاقيات المهنة تعليمات انضباط الطلبة في مؤسسات التعليم العالي رقم 160 لسنة 2007
Week 9	مفهوم وتاريخ الديمقراطية
Week 10	سمات النظام الديمقراطي ومكوناته
Week 11	الدستور والديمقراطية
Week 12	العلاقة بين حقوق الانسان والديمقراطية
Week 13	ضمانات الحريات والحقوق العامة
Week 14	الديمقراطية المعاصرة و شروط قيام الديمقراطية الدستورية
Week 15	the Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	حقوق الانسان والديمقراطية: ا.م.د غسان كريم مجذاب و ا.م.د امجد زين العابدين , 2021	
Recommended Texts	حقوق الانسان والديمقراطية: ا.م.د غسان كريم مجذاب و ا.م.د امجد زين العابدين , 2021	
Websites		

Grading Scheme مخطط الدرجات				
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<tr><td>Module Title</td><td colspan="2">Mathematics 1</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Basic</td><td colspan="3" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ENG 122</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">125</td></tr>
<tr><td colspan="2">Module Level</td><td>1</td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td colspan="2">Sarah Jumah</td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Asst. Lecturer</td><td colspan="2">Module Leader’s Qualification</td><td>M.Sc.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
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العلاقة مع المواد الدراسية الأخرى</th></tr>
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<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Mathematics I aims to provide a comprehensive introduction to the mathematical concepts and techniques that are fundamental to study electrical engineering. During this course, students will develop a solid mathematical foundation that will support their understanding of advanced electrical engineering topics in subsequent semesters. The main module objectives are: 1. Introduce students to the basic mathematical concepts and notation. 2. Develop proficiency in algebraic manipulations and solving equations. 3. Introduce students to understand the concepts of sets, intervals and inequalities. 4. Provide an understanding of analytical geometry. 5. Provide an understanding of trigonometric functions and their applications. 6. Familiarize students with basic concepts of differentiation and the laws of differentiation on various mathematical functions. 7. Familiarize students with basic concepts in linear algebra.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students will be able to: 1. Understand the basic concepts related to this course. 2. Learn the concept of mathematical functions and related mathematical operations. 3. Understand how to represent mathematical functions and equations by drawing. 4. Understand trigonometric functions and their applications. 5. Learn the concept of differentiation and the laws of differentiation on various mathematical functions. 6. Understand how to apply differentiation to various engineering applications in general and applications related to Electrical Engineering in particular. 7. Understand some of the mathematical topics that needed to be understood to enter other courses in the Department of PETROLUME Engineering

Indicative Contents المحتويات الإرشادية	Introduction to calculus: ● Equations and solution methods. ● Elements and Sets. ● Real Numbers and The Real Line. ● Interval, Union and Intersections of intervals. ● Inequalities. ● Analytical Geometry, Distance between Points and Midpoint Formula. ● Slope and Equation of Line. ● Functions (Sums, Difference, Product and Quotients of Functions). ● Domain and Range (Rf) of functions. ● Composition of Functions: ● Absolute Value Function. ● Graph of Functions (Graph of Curves). ● Shifting, Shrinking and Stretching of functions. ● Trigonometric Functions Derivatives ● Definition. ● Derivatives by the Limits. ● Laws of Derivatives. ● Second and Higher Order Derivative. ● Implicit Differentiation. ● The quotient rule for Derivative. ● The Chain Rule. ● Derivative of Parametric Equations. ● Derivative of Trigonometric Functions. ● Applications of Derivatives. Matrices ● Introduction to Matrices: Definition and notation of matrices, matrix elements, size or dimensions of a matrix, special types of matrices (square, rectangular, row vector, column vector), equality of matrices. ● Matrix Operations: Addition and subtraction of matrices, scalar

	multiplication, matrix multiplication. ● Matrix determinant. ● Matrix Inverses. ● Matrix transpose. ● Systems of Linear Equations. ● Cramer's rule. Limits and Continuity ● Introduction. ● Definition. ● Properties of the Limits. ● Right-hand limits and left-hand limits. ● Limit Involving Infinity. ● Continuous Function. ● Algebraic properties of continuous functions.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills in solving problems. This will be achieved through classes, interactive tutorials, home works and quizzes.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
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Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to calculus, Equations and solution methods, Elements and Sets, Real Numbers and The Real Line, Interval, Union and Intersections of Intervals, and Inequalities.
Week 2	Analytical Geometry: Distance between points, Slope and equation of Line, Point Slope Equation, The Distance from Point to a Line, and Angles between two Lines.
Week 3	Assignment + Quiz + Functions : Definition, Domain and Range of Functions, Absolute Value Function, The Greatest Integer Function, and Composition of Functions.
Week 4	Graph of Functions: Symmetry Test for Graphs, Shifting, Shrinking and Stretching.
Week 5	Assignment + Trigonometric Functions: Definition and Identities of Trigonometric Functions, Graph of Trigonometric Functions.
Week 6	Quiz + Derivatives: Definition, Derivatives by the Limits, Laws of Derivatives, and Second and Higher Order Derivative
Week 7	Implicit Differentiation and the Quotient rule for Derivatives.
Week 8	The Chain Rule, Derivative of Parametric Equations, and Derivative of Trigonometric Functions.
Week 9	Assignment + Quiz + Applications of Derivatives, Analysis of Functions: Increase and Decrease, Concavity and Inflection Points, Horizontal and Vertical Asymptotes, and Oblique Asymptotes
Week 10	Mid Term + Matrices: Introduction to Matrices: Definition and notation of matrices, matrix elements, dimensions of a matrix, special types of matrices (square, rectangular, row vector, column vector)
Week 11	Matrices: equality of matrices, Matrix Operations: Addition and subtraction of matrices, scalar multiplication, matrix multiplication, Matrix determinant, Matrix Inverses, Matrix transpose.
Week 12	Assignment + Matrices: Systems of Linear Equations and Cramer’s rule.
Week 13	Quiz + Limits and Continuity: Introduction, Definition, and Properties of the Limits.
Week 14	Right-hand limits and left-hand limits, Limit Involving Infinity, Continuous Function, and Algebraic properties of continuous functions.

Week 15	**Review and solve related problems.**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Thomas, G. B., Weir, M. D., Hass, J., Giordano, F. R., & Korkmaz, R. (2010). *Thomas' calculus* (Vol. 12). Boston: Pearson.	Yes
Recommended Texts	Thomas, G. B., Weir, M. D., Hass, J., Giordano, F. R., & Korkmaz, R. (2010). *Thomas' calculus* (Vol. 12). Boston: Pearson.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Computer I			Module Delivery	
Module Type	Basic			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOM 122				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		Semester of Delivery		2	
Administering Department	Type Dept. PE	College	Type College Code		
Module Leader	Nsaif Jasim	e-mail			
Module Leader's Acad. Title	Asst. Professor	Module Leader's Qualification			
Module Tutor	Nsaif Jasim	e-mail	nsf_jsm@uomisan.edu.iq		
Peer Reviewer Name	Ali dhahir	e-mail	ali_dh11@uomisan.edu.iq		
Scientific Committee Approval Date	1/10/2024	Version Number	1.0		

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1. تعريف الطالب بكيفية استخدام الحاسوب من خلال تعريفة على نظام التشغيل والبرامج الخدمية التي سوف تساعده في دراسته مثل برامج الأوفيس (word 2010 , excel 2010)** **2. التعرف على البرنامج المستخدم لكتابة الاكواد والواجهات بلغة الفجول بيسك والتعرف على اساسيات اللغة وكيفية كتابة الجمل الشرطية وانواع الاوامر لتنفيذها التعرف على العمليات التكرارية واهم الاوامر المستخدمة في التكرار.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1- قدره الطالب على التعامل مع الحاسب الالي وإدارة الملفات والمجلدات** **2- تعلم لغة برمجية مرئية مرنة تلبي الغرض الأساسي لكتابة البرامج التي تساعد الطالب في فهم اساسيات البرمجة وإمكانية التحليل ويتم ذلك من خلال التالي:** **أ- تنصيب برنامج الفجول بيسك** **ب- معرفة الاساسيات وكيفية استدعاء المتغيرات ونوع البيانات التي يتم ادراجها** **ت- معرفة استخدام الجمل الشرطية وتطبيق البرامج الخاصة بها** **ث- معرفة كيفية تكرار تنفيذ الايعازات المتعددة والاوامر المستخدمة في التكرار** **ج- التعرف على بعض الايعازات ذات استخدام محدد لتنفيذ امر** **ح- التعرف على المكتبات المستخدمة والغرض من استدعاءها** **خ- التعرف على كيفية تنفيذ العمليات المنطقية والرياضية**
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies

استراتيجيات التعلم و التعليم	
Strategies	الطريقة الألقائيه الطريقة الحوارية الطريقة الناشطة (تعتمد على نشاط الطالب)

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	22	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Computer basics $ Computer's components**
Week 2	**Operating System (windows 10)**
Week 3	**Application software (Microsoft Office)**
Week 4	**MS word 1**
Week 5	**MS word2**
Week 6	**Excel 1**
Week 7	**Excel 2**
Week 8	**Install program of VB Basic**
Week 9	**study most of VB Basic components**
Week 10	**Arithmetic and logic operations & Input / Output program**
Week 11	**Public and private variables**
Week 12	**If condition & Nested if**
Week 13	**Loops (for) , Loops (while) & Nested loops**
Week 14	**Preparatory week before the final Exam**
Week 15	**the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Computer basics $ Computer's components
Week 2	Operating System (windows 10)
Week 3	Application software (Microsoft Office)
Week 4	MS word 1
Week 5	MS word2
Week 6	Excel 1
Week 7	Excel2
Week 8	Install program of VB Basic
Week 9	study most of VB Basic components
Week 10	Arithmetic and logic operations & Input/Output program
Week 11	Public and private variables
Week 12	If condition & Nested if
Week 13	Loops (for)
Week 14	Loops (while) & Nested loops
Week 15	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts	https://codebun.com/visual-basic-programs-for-beginners-with-examples/	No
Websites	يمكن الولوج الى صفحة الموضوع او من خلال موقع الكلية **www.uomisan.edu.iq/moodle** **or** Getting started with VBA in Office | Microsoft Learn	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="5">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Engineering workshop</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Basic</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">ENG 123</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">3</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">75</td></tr>
<tr><td>Module Level</td><td>1</td><td>Semester of Delivery</td><td colspan="2">1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Saad Hannon & Hussain Madhi</td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Lecturer</td><td>Module Leader’s Qualification</td><td colspan="2">Ms.C</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	To introduce basic workshop practices, production, labor, and time requirements of workshop operations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	This course is essential in all engineering branches providing the students with the general basics of engineering science. by completing this course, students will be able: - 1- To understand how the world, both natural and man-made, works. 2-To have a good knowledge of safety rules on-site in an industrial environment and increase the knowledge about the use of working tools, instruments, and machines. 3-To present a general guide for solving problems. 4-To introduce the concept of free body diagram and equilibrium equation.
Indicative Contents المحتويات الإرشادية	Workshop Skills The students are introduced to training programs in four workshops: welding, turning, carpentry, and casting.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	Maintain the ray of hope for the weak individuals through the stable opportunity to override failure. Motivate the spirit of competition between the students

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري

	Material Covered
Week 1	**CARPENTRY : Carpentry Tools, Cutting Tools, Planes**
Week 2	**Boring Tools, Jigsaw, Power planes, Circular saw, Router Cutters, Orbital Sander**
Week 3	**FITTING : Holding Tools, Striking Tools, Cutting Tools**
Week 4	**Measuring, Marketing and Testing Tools, Impact Driver, Chain Saw, Angle Grinder**
Week 5	**Drilling Machine, Nail Gun, Impact Wrench, Cut off Machine**
Week 6	**WELDING Arc welding equipment**
Week 7	**Gas welding: Oxy acetylene welding equipment**
Week 8	**Soldering equipment, Brazing equipment** Structure Item: Indirect Questions
Week 9	**TURNING Turning machine (lathe)**
Week 10	**Cutting machine** +Quiz
Week 11	**Drilling machine**
Week 12	**Milling machine**
Week 13	**CASTING: Furnaces**
Week 14	**Sand Casting, Molding box, Cores, Casting inspection equipment**
Week 15	**FORGEABILITY: Anvil, Forging Hand Tools, Hammers, Tongs, Hearth, Swage block** Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Engineering Mechanics</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Basic</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 112</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">125</td></tr>
<tr><td colspan="2">Module Level</td><td>1</td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td colspan="2">Ali Hussein Hassan</td><td>e-mail</td><td colspan="2">al_azzawwi@uomisan.edu.iq</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Lecturer</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="2">1.0</td></tr>
</table>

<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Drilling Engineering, production Engineering</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aims of Engineering Mechanics are to provide a fundamental understanding of the principles and laws governing the behavior of physical systems, with a focus on mechanical systems. This discipline is essential for engineers as it lays the foundation for analyzing and solving problems related to the design, operation, and maintenance of structures and machines. The specific module aims of Engineering Mechanics may vary depending on the educational institution and the level of study. However, here are some common aims that are typically covered in Engineering Mechanics courses: Overall, the module aims to equip students with a solid foundation in mechanics, enabling them to analyze and design mechanical systems and structures, and providing a basis for further study in engineering disciplines such as civil, mechanical, and aerospace engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The specific learning outcomes of an Engineering Mechanics module may vary depending on the educational institution and the level of study. However, here are some common learning outcomes that are typically associated with Engineering Mechanics courses: Knowledge and understanding of fundamental principles: Students should demonstrate a solid understanding of the fundamental principles of mechanics, including Newton's laws of motion, equilibrium conditions, conservation of energy and momentum, and their application to mechanical systems. Problem-solving skills: Students should be able to apply the principles of mechanics to solve engineering problems. They should demonstrate the ability to analyze and model the behavior of mechanical systems, calculate forces, moments, and stresses, and apply appropriate equations and formulas to solve problems. Effective communication and teamwork: Students should be able to communicate their ideas, analysis, and solutions effectively, both in written and verbal forms. They should also be able to work collaboratively in teams, demonstrating effective teamwork and the ability to contribute to group discussions and projects. These learning outcomes aim to provide students with a solid foundation in Engineering Mechanics, preparing them for further study or professional practice in engineering disciplines that require a strong understanding of mechanics, such as civil

	engineering, mechanical engineering, aerospace engineering, and more. .
Indicative Contents المحتويات الإرشادية	Introduction to Engineering Mechanics: Overview of mechanics and its importance in engineering, Fundamental concepts and definitions, Units and dimensions, Scalars and Vectors: Differentiation between scalar and vector quantities, Vector operations, such as addition, subtraction, and multiplication, Components and coordinate systems, Force Systems and Equilibrium: Types of forces (e.g., gravitational, applied, frictional) Resultant and equilibrium conditions Free-body diagrams and analysis of forces Newton's Laws of Motion: Newton's three laws of motion and their applications Force and acceleration Application of Newton's laws to solve problems Applications of Newton's Laws: Motion of particles in one and two dimensions Projectile motion Circular motion and centripetal force Work, Energy, and Power: Work done by forces Kinetic and potential energy Conservation of mechanical energy Power and efficiency Impulse and Momentum:

	Linear momentum and its conservation Impulse-momentum theorem Collisions and impact Statics of Rigid Bodies: Equilibrium conditions for rigid bodies Analysis of trusses, frames, and machines Distributed forces and centroids Friction and its effects Kinematics of Rigid Bodies: Translation, rotation, and general plane motion Angular velocity and acceleration Relative motion analysis Dynamics of Rigid Bodies: Moment of inertia and its properties Equations of motion for rotating bodies Torque and angular momentum Structural Analysis: Analysis of simple structures (e.g., beams, columns) Axial loading, bending moments, and shear forces Stress and strain analysis Applications to Engineering Problems: Application of Engineering Mechanics principles to real-world engineering problems Case studies and examples from various engineering disciplines Design considerations and optimization These topics provide a comprehensive overview of Engineering Mechanics, covering the fundamental principles and their applications to various mechanical systems and structures. The actual contents and depth of coverage may vary, and additional topics may be included

	based on the specific requirements of the curriculum and the level of study.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lectures: Lectures are a common teaching method used to deliver key concepts and theoretical foundations of Engineering Mechanics. In lectures, instructors present the material using visual aids, demonstrations, and examples. This allows students to gain a theoretical understanding of the subject matter. Tutorials and Problem-solving Sessions: Tutorials and problem-solving sessions provide students with opportunities to apply the principles and concepts learned in lectures to solve engineering problems. In these sessions, students work through practice problems individually or in groups, guided by the instructor. This helps reinforce understanding, develop problem-solving skills, and clarify any misconceptions. Laboratory Sessions: Laboratory sessions provide hands-on experience with physical experiments or computer simulations related to Engineering Mechanics. These sessions allow students to observe and measure physical phenomena, validate theoretical concepts, and develop practical skills in data collection and analysis. Lab sessions may also involve the use of software tools for modeling and simulation. Interactive Discussions: Interactive discussions, such as seminars or group discussions, encourage active participation and critical thinking among students. Instructors may present case studies, real-world examples, or challenging problems to stimulate discussion and promote deeper understanding of Engineering Mechanics principles. This strategy also allows students to share their perspectives, ask questions, and engage in collaborative learning.

	Computer-Aided Learning: Computer-aided learning tools, such as online tutorials, interactive simulations, or virtual laboratories, can enhance understanding and provide additional resources for students. These tools enable students to explore concepts, visualize complex phenomena, and engage in self-paced learning. Design and Project Work: Design projects or assignments related to Engineering Mechanics provide opportunities for students to apply their knowledge and skills to practical engineering problems. Students may be tasked with analyzing and designing structures, evaluating mechanical systems, or optimizing designs based on given constraints. These projects enhance critical thinking, problem-solving abilities, and teamwork. Formative Assessments: Formative assessments, such as quizzes, in-class exercises, or online assessments, are used to provide feedback and monitor students' progress throughout the module. These assessments help identify areas where students may need additional support or clarification, allowing instructors to adjust their teaching methods accordingly.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري		
	Material Covered	
Week 1	Force system: (force, moment, couple, resultant of forces)	Statics
Week 2	Equilibrium: (Conditions of Equilibrium, Free Body Diagram, Two and Three Force Member)	
Week 3	Friction: (Characteristics of Friction, Types of Friction and Application of Friction).	
Week 4	Center of Gravity and Centroid: (Center of Mass and Body, Centroids of Lines, Area and Volume, Composite Bodies and Figures).	
Week 5	Moments of Inertia: (Definition of Moments of Inertia for Area, Moments of Inertia for Composite Areas and Moments of Inertia for an Area about Inclined Axes).	
Week 6	(Newton's Laws: (First, Second and third Law)	Dynamics
Week 7	Mid-term Exam	
Week 8	Kinematic of Particle: (Rectilinear Motion, Curvilinear Motion)	

Week 9	Kinetic of Particle: (Force, Mass and acceleration).	
Week 10	Kinetic of Particle: (Work and Energy and Rotation).	
Week 11		
Week 12		
Week 13		
Week 14		
Week 15		
Week 16		

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Meriam, J.L. and Kraige, L.G. 2002., Engineering Mechanics Statics, Fifth Edition, John Willey & Sons Inc.**	yes
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**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.

MODULE DESCRIPTION FORM

Module Information معلومات المادة الدراسية			
Module Title	**Strength of Materials**	**Module Delivery**	
Module Type	**BASIC**	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**PE 113**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		

Module Level	**1**	**Semester of Delivery**	1
Administering Department	Type Dept. PE	**College**	Type College Code
Module Leader	Noor K. Faheed	**e-mail**	Noor.kf@uomisan.edu.iq
Module Leader's Acad. Title	Teacher	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modules			
Prerequisite module	Mechanics of Materials	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	• As the engineering design of different components, structures etc. used in practice are done using different kinds of materials, it is essential to understand the basic behavior of such materials
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Lectures series on Strength of Materials are prepared, explaining the fundamentals in a simple and lucid manner so that the students can grasp the basics of the application of loading system and its consequence in a deformable body.

Learning and Teaching Strategies	
Strategies	Type something Like the main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	**Introduction to strength of materials** • Introduction—Concept of Simple Stress and Strain • Axial Loading; Normal Stress • Shearing Stress • Bearing Stress
Week 2	• Stress and Strain—Axial Loading • Tensile test • Stress-Strain Diagram • True Stress and True Strain
Week 3	• Hooke's Law; Modulus of Elasticity • Deformations of Members under Axial Loading • Plastic Deformations • Elastic versus Plastic Behavior of a Material
Week 4	• Poisson's Ratio • Longitudinal strain • Lateral strain • Application of Poisson's ratio to a two-dimensional stress system

Week 5	• Shear stress • Shear strain • Modulus of rigidity • Thermal Stress
Week 6	• Thin Cylinders and Shells • Thin cylinders under internal pressure • Hoop or circumferential stress • Longitudinal stress • Changes in dimensions
Week 7	• Thin spherical shell under internal pressure • Change in internal volume
Week 8	• Torsion • Simple torsion theory • The Angle Of Twist • Shear Stress And Shear Strain In Shafts • The Maximum Shear Stress
Week 9	• Series connection of the shafts • Parallel Connection Of The Shafts • Power Transmitted By Shafts
Week 10	• Helical Springs • Spring deformation • SPRINGS IN SERIES • Spring in parallel
Week 11	• Flanged bolt
Week 12	• Slope and deflection of beams • Buckling
Week 13	• Bending theory and second moment of area
Week 14	• Final Project and Exam Preparation • Exam preparation and review
Week 15	• Final Exam

Delivery Plan (Weekly Lab. Syllabus) **المنهاج الاسبوعي للمختبر**	
	Material Covered
Week 1	Lab 1: Tensile Test
Week 2	Lab 2: Compression Test
Week 3	Lab 3: Shear Test

Week 4	Lab 4: Impact Test
Week 5	Lab 5: Hardness Test
Week 6	Lab 6: Torsion Test
Week 7	Lab 7; bending test
Week 8	Lab 13:Review
Week 9	Lab 14:Examination
Week 10	Lab 15:Final examination

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Strength of Materials 3rd Edition. • Mechanics of Materials, Ninth Edition, 2014, Published by Pearson Prentice Hall R.C. Hibbeler	Yes
Recommended Texts	• Mechanics of Materials, Seventh Edition, 2015 Published by McGraw-Hill Education • Ferdinand P. Beer • E. Russell Johnston, Jr. • John T. DeWolf David F. Mazurek	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information					
Module Title	**Engineering Drawing and Description Geometry**		**Module Delivery**		
Module Type	**Basic**		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	**ENG 128**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. PE		**College**	Engineering College	
Module Leader	Dheyaa Sabeeh AL-SAEDI		**e-mail**	Diaa.sabeeh@uomisan.edu.iq	
Module Leader's Acad. Title	Asst. Lect		**Module Leader's Qualification**	Master	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/10/2024		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	The engineering drawing and descriptive geometry module is designed to deliver overview understanding of the basics, principles and techniques involved in engineering drawing and descriptive geometry. This course deals with identifying engineering drawing tools and materials, methods of using them, performing manual exercises, drawing lines, curves, and two- and three-dimensional shapes.

	Thus, developing the student's potential to study and apply the basics of engineering drawing. Which includes reading, disassembling and assembling geometric shapes through drawing, projection, and sections methods.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowing the tools used in engineering drawing and how to use them properly. 2. The student's ability to understand and apply the basics of engineering drawing. 3. Reading, disassembling and assembling geometric shapes through drawing, projection and cross sectional methods. 4. Developing the student's skill in using tools in drawing geometric shapes. 5. Developing the student's engineering imagination through deducing the projections and sections of each geometric solid and realizing its dimensions. 6. Communicate with the most important ideas presented by the article through Internet.
Indicative Contents المحتويات الإرشادية	1- Introduction to the subject: basics of engineering drawing and the difference between it and free hand drawing: Engineering drawing, its elements, tools and drawing methods. 2- Introducing students to paper scales and drawing boards, and Free hand drawing (lines, circles, ...etc) 3- Distribute the canvas (frame, table, etc.), Types of lines in engineering drawing, Rules for writing dimensions and measurements and recognizing symbols and their significance, drawing scales (zoom in and zoom out) 4- Construction and engineering operations: Create and divide angles, Divide circles and draw regular shapes in them. Create connecting lines between arcs and circles. 5- Drawing engineering perspectives, Types of engineering perspectives and its construction from projections. Perspective constructions (drawing 3D solids (isometric perspective) 6- Projection in orthogonal planes, vertical projection methods, Drop geometric shapes. 7- Distribution of projections on the drawing board, Conclusion of the third projection from two projections. 8- Inferring the isometric perspective from projections with dimensions 9- Single simple and complex geometric objects 9- Sections in engineering drawing, their importance, Cutting, sector, and hatching levels, Types of sectors and their classification. 10- Using real 3D models to help students see the 2D model drawn in the book (as a way of elucidation more acceptable to students).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Planning a unit or lesson involves a number of instructional decisions. The teacher must identify the following: the content and processes to be

	addressed, the strengths, needs, and interests of students, the Common Essential Learnings that could be incorporated, and the most effective instructional approaches. Such decisions are critical and must be made consciously and purposefully. It begins with the student's interest in engineering tools and the drawing board. To reach the highest level of understanding in the application of all theoretical and laboratory lesson processes.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments/ classwork	15	15% (15)	Continuous	All
	Assignments/ Homework	15	15% (15)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	• **Engineering drawing**: overview of engineering drawing objectives, importance and applications. Drawing tools and instruments, Types of paper and their scales, Drawing boards. • **Description geometry**: overview of description geometry and its principle.
Week 2	• **Engineering drawing:** Lines in engineering drawing, Type of lines. Paper layout (frame, title block), drawing simple shapes using different types of lines, and practice on how to use drawing tools. • **Description geometry** : representation of points, lines and planes
Week 3	• **Engineering drawing:** Lettering and numbering (Arabic and English), simple engineering operations. • **Description geometry:** drawing of point, drawing of line segments of particular position.
Week 4	• **Engineering drawing:** engineering operations of lines, angles, triangles; divide, transfer, parallel and drawing. • **Description geometry:** determination of true length of a line by revolution and auxiliary planes, point view of a line, true size and true shape of a plane.
Week 5	• **Engineering drawing:** engineering operations of circles and arcs. • **Quiz 1** • **Description geometry:** True distance between two points, a point and a line, a point and a plane, parallel lines and two planes.
Week 6	• **Engineering drawing:** engineering operations of Polygon, Hexagonal, pentagonal and quadruple. • **Description geometry:** types of planes, application of lines and planes.
Week 7	• **Engineering drawing:** engineering operations of Ellipse, types of Ellipse. • **Mid-term exam.** • **Description geometry:** orthogonal projections; Mutual positions of a point and a line, the relative positions of straight lines, method of replacing planes of projection
Week 8	• **Engineering drawing:** engineering operations of tangential; lines, arc and two circles. • **Description geometry:** traces of a line, traces of planes
Week 9	• **Engineering drawing:** orthogonal projections; first angle of projections, third angle of projections. • **Description geometry:** finding line of intersection of planes by traces and projections.
Week 10	• **Engineering drawing:** Concluding 3rd projector and do more exercise of projection drawing.

	• **Quiz 2** • **Description geometry:** review of lines, planes projections, and relevant notes of projections.
Week 11	• **Engineering drawing:** Notes on projection's topic, projections of complex parts (complex shape) • **Description geometry:** principle of surface, rules of surfaces and development of surfaces.
Week 12	• **Engineering drawing:** principle of section; section lines, full sections, section planes, half sections, zigzag sections. • **Description geometry:** rotation surfaces and mutual of intersection surfaces.
Week 13	• **Engineering drawing:** Partial sections, Non-cut parts, Notes on sections. • **Description geometry:** review of development of surfaces.
Week 14	• **Engineering drawing:** Theory of dimensions, Dimension elements, Oblique dimensions, Dimension symbols. • **Description geometry:** axonometric projections; to construct the isometry and dimetry surfaces.
Week 15	• **Engineering drawing:** Leader dimensions, Circle and angle dimensions. Notes on dimensions • **Description geometry:** Transformation of the drawing.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	• Systematic engineering drawing book , author Jaafar Al-Khafaf كتاب الرسم الهندسي المنهجي ,للمؤلف عبد الرسول الخفاف • Descriptive Geometry; S.P. Burkova, G.F. Vinokurova, R.G. Dolotova	Yes
Recommended Texts	• Luzadder, Fundamentals of Engineering Drawing, Prentice. • French, C.J. Vierck and R.J. Foster, Engineering Drawing and Graphic Technology, McGraw-Hill, 1981.	No

Grading Scheme

مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information				
Module Title	Stratigraphy and Sedimentology		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	PE 121			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level			Semester of Delivery	1
Administering Department	Type Dept. PE		College	Type College Code
Module Leader	Riaed Al Siaede		e-mail	DR.RA.IRAQ@UOMISAN.EDU.IQ
Module Leader's Acad. Title	Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/10/2024		Version Number	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	teaching and applying the principle of historical geology and the relative age of geological events and the relation between these events and the accumulation of petroleum. Also the distribution of sedimentary environments and the petrophysical properties of each sedimentary basin were explained.
Module Learning	The student will understand the depositional environments and the historical

Outcomes مخرجات التعلم للمادة الدراسية	events which controlled the distribution of oil fields, and how can used this knowledge to explore new oil traps and analysis the quality of reservoir rocks.
Indicative Contents المحتويات الإرشادية	Maps, Figures and movies.

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation				
	Time/Nu	**Weight (Marks)**	**Week Due**	**Relevant Learning**

		mber			Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Define the stratigraphy. The methods for rock age measurements The relative and absolute age determination methods.
Week 2	The main geological principles. Find relative age of geological formations by geological principles.
Week 3	Geological time scale
Week 4	The depositional environments Continental environments.
Week 5	Transitional depositional environment
Week 6	Marine depositional environment.
Week 7	Marine depositional environment.
Week 8	The relation between plate tectonic and depositional environment
Week 9	The designation of rock units The Formation, Member and Group.

Week 10	The Geological succession of Iraq oil fields.
Week 11	The classification of main sedimentary rock groups
Week 12	Terrigenous rocks Classification Texture. Sorting, roundness. Maturity.
Week 13	Carbonate rock depositional environment and classification.
Week 14	Examples about sedimentary environments.
Week 15	Project Discussions , Preparatory week before the final Exam
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: geological time scale principals
Week 2	Lab 2: relative age measuring
Week 3	Lab 3: transgression and regression
Week 4	Lab 4: thin section classification
Week 5	Lab 5: the development of depositional environment
Week 6	Lab 6: Facies maps
Week 7	Lab 7: analysis facies maps.

Learning and Teaching Resources		
	Text	**Available in the**

		Library?
Required Texts	Physical geology, Plumer Carelson,2020	Yes
Recommended Texts	Principles of Sedimentology and Stratigraphy (4th Edition), Boggs,2005.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Mathematics 2			Module Delivery	
Module Type	Basic			☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	ENG 124				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	1		Semester of Delivery		1
Administering Department	Type Dept. PE		College	Type College Code	
Module Leader	Sara jumaa		e-mail		
Module Leader's Acad. Title	Asst. Lecturer		Module Leader's Qualification		master
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name	Name		e-mail	E-mail	
Scientific Committee Approval Date	1/10/2024		Version Number	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Mathematics II aims to introduce students to the concept of integration and its importance to electrical engineering. Students will learn various integration methods, applications of definite integrals, and numerical integration. In addition to that, transcendental functions, complex numbers and polar coordinates will be

	covered in Mathematics II. The module objectives can be concluded as follow: 1. Introduce students to understand the concept of integration and how to solve related problems. 2. Identify different integration techniques and use them correctly to find the integrals of different functions. 3. Understand the effective methods of using integrals in problems related to electrical engineering applications. 4. Understand how to deal with complex numbers and use it with all associated mathematical operations 5. Familiarize students with the concepts of polar coordinates.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students will be able to: 1. Understand the concept of integration and its importance in engineering applications. 2. Demonstrate proficiency in performing basic integration operations. 3. Apply integration techniques, including substitution, integration by parts, partial fractions, and trigonometric substitutions, to solve a variety of engineering problems. 4. Analyze and interpret the geometric and physical significance of definite integrals in the context of electrical engineering, such as computing areas and volumes. 5. Utilize numerical integration techniques, such as the trapezoidal rule and Simpson's rule, to approximate definite integrals in practical scenarios. 6. Perform arithmetic operations with complex numbers and find complex conjugates. 7. Convert equations between rectangular and polar forms.
Indicative Contents المحتويات الإرشادية	Indefinite Integrals ● Rules for indefinite integrals ● Integration of trigonometric functions ● Solving Initial Value Problems with Indefinite Integrals ● Definite Integrals ● Rules for Definite Integrals

	Techniques of Integration ● Basic Integration Formulas (by Substitution) ● Integration by Parts ● Tabular integration. ● Trigonometric Integrals ● Definite integrals of odd and even functions ● Integration by Trigonometric Substitutions ● Integrating Rational Functions by Partial Fractions ● Integration by substitution ● Numerical integration (The Trapezoidal Rule and Simpson Rule) Application of Integrals: ● Area under a curve ● Finding the area between two curves ● Volume of solids of revolution ● Length of curves Transcendental Functions: ● Inverse functions ● Logarithmic functions Complex Numbers: ● Complex numbers and operations ● Graphical representation of complex numbers ● Polar form of a complex number Polar Coordinates: ● Definition of polar coordinates ● Polar equations and graphs ● Polar and cartesian coordinates ● Graphing polar coordinate equations

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills in solving problems. This will be achieved through classes, interactive tutorials, home works and quizzes.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Integration: Indefinite Integrals, Rules for Indefinite Integrals, Integration of Trigonometric Functions.
Week 2	Solving Initial Value Problems with Indefinite Integrals, Definite Integrals, Rules for Definite Integrals.
Week 3	Assignment + Quiz + Techniques of Integration, Basic Integration Formulas by Substitution, and Integration by Parts.
Week 4	Tabular Integration, Trigonometric Integrals, and Definite Integrals of Odd and Even Functions.
Week 5	Assignment + Quiz + Integration by Trigonometric Substitutions.
Week 6	Integrating Rational Functions by Partial Fractions.
Week 7	Integration by Substitution and Integrating of the Roots.
Week 8	Mid Term + Numerical integration: Trapezoidal Rule and Simpson Rule.
Week 9	Application of Integrals: Area Under a Curve and Finding Area between two Curves.
Week 10	Volume of Solids of Revolution.
Week 11	Length of Plane curves and Area of Surface of Revolution.
Week 12	Assignment + Quiz + Transcendental Functions: Inverse Functions and Logarithmic Functions.
Week 13	Complex Numbers, Complex Numbers and Operations, Graphical Representation of Complex Numbers, and Polar Form of a Complex Number.
Week 14	Polar Coordinates: Definition of Polar Coordinates, Polar Equations and Graphs, Polar and Cartesian Coordinates, and Graphing Polar Coordinate Equations.
Week 15	Assignment + Quiz + **Review and solve related problems.**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information

<table>
<tr><td>Module Title</td><td colspan="3">Physics</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Basic</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">ENG 125</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td>Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td colspan="2">2</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Maryam J. Jaafar</td><td>e-mail</td><td colspan="3">mariamjabor94@gmail.com</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Lect.</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Asst. Lect.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>Thermodynamic, Fluid,</td><td>Semester</td><td></td></tr>
</table>

<table>
<tr><td colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td></tr>
<tr><td>Module Aims
أهداف المادة الدراسية</td><td>Physics provides the student with sufficient information about the nature of materials and how to use measurement units in different systems to measure the different properties of materials through understanding their nature, entering into the energy system and preserving it, and providing him with important information about the types of movements and their representation with functions. Then study fluids and their principles</td></tr>
</table>

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Physics plays a crucial role in the petroleum industry in various ways. Below are a few examples: 1. The principles of physics are extensively used to explore petroleum reservoirs. Techniques such as seismic surveying involve creating shock waves that penetrate the ground and are reflected on the surface by changes in rock layers. The data collected is then analyzed using physical principles to determine the structure and composition of the Earth's interior. This helps to locate possible petroleum reservoirs. 2. Fluid Dynamics: The study of fluid flow is a significant part of the petroleum industry. Oil recovery processes, such as primary, secondary, and tertiary, depend heavily on understanding how oil, water, and gas move through porous rock formations. The principles of fluid mechanics, a branch of physics, are fundamental in designing and optimizing these processes. 3. Thermodynamics: Petroleum extraction often involves changing pressure and temperature conditions. Understanding these changes and how they affect the properties of crude oil and natural gas is critical for efficient extraction and refining. For instance, phase changes from gas to liquid (condensation) and liquid to gas (evaporation) are common in the industry, governed by the principles of thermodynamics. 4. Reservoir Physics: Physics helps in understanding and modeling reservoir behaviors. Using different physical principles can predict how the reservoir will react to different drilling and extraction strategies, which can optimize the production strategy. 5. Materials Science: Physics also impacts the materials used in the petroleum industry. From the metallurgy of drill bits to the design of pipelines that can withstand extreme pressures and temperatures, an understanding of the physical properties of materials is essential. In summary, physics principles are fundamental to the petroleum industry, impacting everything from the initial exploration of oil and gas deposits to the extraction and refining of these resources..
Indicative Contents المحتويات الإرشادية	Materials Science: Physics also impacts the materials used in the petroleum industry. From the metallurgy of drill bits to the design of pipelines that can withstand extreme pressures and temperatures, an understanding of the physical properties of materials is essential.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية				
	Time/Nu	**Weight (Marks)**	**Week Due**	**Relevant Learning**

		mber			Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	What Is Physics, Measuring Things, The International System of Units, Dimensions of some important variables, Energy, Work, Power, Gravitational Potential Energy, Kinetic energy, The Conservation of Energy, Oscillatory Motion, Simple Harmonic Motion
Week 2	Energy in Simple Harmonic Motion, Periodic time and sinusoidal nature for SHM, Position as a Function of Time in SHM, Velocity and Acceleration as Functions of Time in SHM. Wave motion, Types of Waves and Their Speeds: Transverse and Longitudinal Speed of Transverse Waves, Speed of Longitudinal Waves, Energy Transported by Waves, Intensity Related to Amplitude and Frequency.
Week 3	Wave motion, Types of Waves and Their Speeds: Transverse and Longitudinal Speed of Transverse Waves, Speed of Longitudinal Waves, Energy Transported by Waves, Intensity Related to Amplitude and Frequency. Sound waves, ,Fluid, Density, viscosity
Week 4	Pressure, Pascal principle, Archimedes principle, Phases of Matter, Density and Specific Gravity, Pressure in Fluids, Atmospheric Pressure and Gauge Pressure. quiz

Week 5	Gauge Pressure, Fluids in Motion; Flow Rate, the Equation of Continuity, Bernoulli's Equation, Heat, Specific Heat, Heat Transfer, Conduction
Week 6	Convection, Radiation, Coulomb's Law, Flux, Electric potential, Gauss law, Electric Charge and Electric Field, Insulators and Conductors, Semiconductors. Contact angle,
Week 7	Stress, Strain, Surface tension, Interfacial tension.
Week 8	Introduction to Temperature And Heat, Temperature and the Zeroth Law of Thermodynamics, Heat transfer and its methods, Temperature Scales, Specific heat, Specific volume, Calorimetry
Week 9	Phases and Properties of Pure Substances, Property Diagrams for Phase-Change Processes, Thermal equilibrium, Thermal expansion
Week 10	Linear, areal and volume expansion of solid, Volume expansion of liquid and gases, Gas laws, The Ideal-Gas Equation of State. Quiz.
Week 11	Compressibility Factor—A Measure of Deviation from Ideal-Gas Behavior, Other Equations of State, Exergy Transfer by Work, Applications of work.
Week 12	Energy Conversion and General Energy Analysis, Energy Balance, Energy Change of a System, and Mechanisms of Energy Transfer, Thermal Energy Reservoirs, Heat Engines, Basic Considerations in the Analysis of Power Cycles, The Carnot Cycle and Its Value in Engineering
Week 13	Basic Considerations in the Analysis of Power Cycles, The Carnot Cycle and Its Value in Engineering Entropy, Entropy Change of Liquids and Solids,
Week 14	The Entropy Change of Ideal Gases Entropy, Entropy Change of Liquids and Solids, The Entropy Change of Ideal Gases
Week 15	Completion of student presentations Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Halliday, David, Robert Resnick, and Jearl Walker. *Fundamentals of physics*. John Wiley & Sons, 2013.	
Recommended Texts	Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.	
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Analytical Chemistry**			**Module Delivery**	
Module Type	**Basic**			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**ENG 126**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**1**			**Semester of Delivery**	**2**
Administering Department	Type Dept. Code			**College**	Type College Code
Module Leader	Salam Abdul-Zahra Khalefa			**e-mail**	Salam.iq2022@uomisan.edu.iq
Module Leader's Acad. Title	Assis.Lec.			**Module Leader's Qualification**	Master
Module Tutor	Name (if available)			**e-mail**	E-mail
Peer Reviewer Name	Name			**e-mail**	E-mail
Scientific Committee Approval Date				**Version Number**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Review of basic concepts: This includes reviewing the fundamental concepts in chemistry and ensuring a proper understanding of them.

	2. Chemical stoichiometry: This involves studying percentages, chemical reactions, and the associated calculations. 3. Chemical reactions and heat: This include studying chemical reactions and the energy released or consumed during these reactions. 4. Organic chemistry: This focuses on the study of organic compounds and their chemical functions. 5. Fuels: This involves studying different types of fuels, their properties, and their uses. 6. Various batteries and electronic cells: This include studying different types of batteries and electronic cells and their applications. 7. Principles of corrosion: This aims to understand the principles of corrosion, its mechanisms, and methods of prevention. 8. Water for domestic uses: This relates to the properties of water and its applications in domestic settings and water treatment. 9. Industrial water: This focuses on the properties and uses of water in industry and its treatment. 10. Atmospheric pollution: This involves studying air pollution, its sources, and its impact on the environment.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. A solid understanding of the fundamental concepts in chemistry. 2. The ability to study percentages, chemical reactions, and perform related calculations. 3. Understanding of chemical reactions and the energy released or consumed during these reactions. 4. Comprehensive knowledge of organic compounds and their chemical functions. 5. Study of different types of fuels, their properties, and their uses. 6. In-depth understanding of various batteries, electronic cells, and their applications. 7. Understanding the principles of corrosion, its mechanisms, and preventive methods. 8. Understanding the properties of water and its applications in domestic settings and water treatment. 9. Knowledge of the properties and uses of water in industry and its treatment. 10. Study of air pollution, its sources, and its impact on the environment.
Indicative Contents المحتويات الإرشادية	1- Review of basic concepts: Reviewing fundamental concepts in chemistry such as atoms, elements, and molecular structure. Chemical forces, reactions, and chemical equilibrium. Factors affecting the rate of chemical reactions. 2- Chemical stoichiometry: Calculating chemical stoichiometry and related chemical reactions.

Using percentages and chemical equations in stoichiometry calculations.

3- Chemical reactions and heat:

Studying the energy released or consumed during chemical reactions.

Applying the concept of heat changes in chemical reactions.

4- Organic chemistry:

Studying organic compounds, their classification, and chemical properties.

Understanding basic organic reactions and their chemical functions.

5- Fuels:

Studying different types of fuels, including fossil fuels and biofuels.

Understanding the properties and uses of fuels in industry, transportation, and energy.

6- Various batteries and electronic cells:

Studying different types of batteries and electronic cells and their operating principles.

Exploring applications of batteries and electronic cells in electronic devices and renewable energy.

7- Principles of corrosion:

Studying corrosion mechanisms and contributing factors.

Analyzing different types of corrosion, such as chemical corrosion and electrochemical corrosion.

Studying corrosion prevention and protection techniques, such as the use of corrosion-resistant materials and protective coatings.

8- Water for domestic uses:

Understanding the properties of water and its treatment for domestic purposes.

Studying water quality standards and household water treatment processes like filtration and disinfection.

9- Industrial water:

Exploring the uses of water in industry and understanding the treatment methods for industrial water preparation.

	Studying the applications of water in industrial processes such as cooling, cleaning, and drying. 10- Atmospheric pollution: Studying sources of air pollution and their impact on the environment and public health. Analyzing common air pollutants such as greenhouse gases, particulate matter, and volatile organic compounds. Studying pollution control techniques and legislation related to air quality protection. This academic curriculum aims to enhance students' understanding of the fundamental concepts and knowledge in these various chemical fields and raise awareness of relevant environmental issues. The expected outcomes for students include a deeper understanding of chemical principles and the ability to apply them in different scientific and technological contexts.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy in delivering the Chemistry module to first-year students in the Petroleum Engineering department relies on both theoretical and practical aspects, including laboratory work, homework assignments, and scientific report writing. The strategy emphasizes encouraging student participation in exercises and interactive learning while developing and expanding their practical skills through hands-on laboratory work. The focus will be on acquiring theoretical and practical knowledge, completing homework assignments, and preparing scientific reports and projects.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Review Of Basic Concepts (Analytical Chemistry)

Week 2	Concentration & Units for Expressing Concentration
Week 3	Chemical Stoichiometry
Week 4	Chemical Reactions and Heat
Week 5	Organic Chemistry
Week 6	Types of Hydrocarbons
Week 7	Mid-Term Exam
Week 8	Introduction to Fuels
Week 9	Various Batteries and Electronic Cells
Week 10	Principles Of Corrosion
Week 11	Control Of Corrosion
Week 12	Environmental Pollution
Week 13	Industrial Water
Week 14	Water For Domestic Uses
Week 15	Water Pollution and Preparatory Week Before the Final Exam
Week 16	Preparatory Week Before the Final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Preparation of a solution of pure sodium carbonate (initial standard solution)
Week 2	Preparation of hydrochloric acid solution (secondary standard solution)
Week 3	Titration of Hydrochloric Acid with Sodium carbonate
Week 4	Titration of Hydrochloric Acid with Sodium Hydroxide
Week 5	The reaction of a mixture (strong base and weak base) with a strong acid

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1. Quantitative Chemical Analysis" by Daniel C. Harris 2. Chemistry: The Central Science" by Theodore L. Brown, H. Eugene LeMay, Bruce E. Bursten, Catherine Murphy, and Patrick Woodward 3. Organic Chemistry" by Paula Yurkanis Bruice 4. Principles of Corrosion Engineering and Corrosion Control" by Zaki Ahmad 5. Environmental Chemistry" by Stanley E. Manahan	
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C - Good	جيد	70 - 79	Sound work with notable errors
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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.

MODULE DESCRIPTION FORM

Module Information			
Module Title	**Thermodynamic**	**Module Delivery**	
Module Type	**Basic**	☒ **Theory**	

<table>
<tr><td>Module Code</td><td colspan="3">PE 122</td><td colspan="2" rowspan="3">☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td colspan="2">Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>2</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td colspan="2">Qudama Mohammed Qasim</td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>lecturer</td><td colspan="2">Module Leader’s Qualification</td><td>lecturer</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="2">1.0</td></tr>
</table>

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	**Semester**	
Co-requisites module	Thermodynamic, Fluid,	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	Thermodynamic provides the student with sufficient information about the nature of materials and how to use measurement units in different systems to measure the different properties of materials through understanding their nature, entering into the energy system and preserving it, and providing him with important information about the types of movements and their representation with functions. Then study

	fluids and their principles
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Thermodynamic plays a crucial role in the petroleum industry in various ways. Below are a few examples: 1. The principles of Thermodynamic are extensively used to explore petroleum reservoirs. Techniques such as seismic surveying involve creating shock waves that penetrate the ground and are reflected on the surface by changes in rock layers. The data collected is then analyzed using physical principles to determine the structure and composition of the Earth's interior. This helps to locate possible petroleum reservoirs. 2. Fluid Dynamics: The study of fluid flow is a significant part of the petroleum industry. Oil recovery processes, such as primary, secondary, and tertiary, depend heavily on understanding how oil, water, and gas move through porous rock formations. The principles of fluid mechanics, a branch of physics, are fundamental in designing and optimizing these processes. 3. Thermodynamics: Petroleum extraction often involves changing pressure and temperature conditions. Understanding these changes and how they affect the properties of crude oil and natural gas is critical for efficient extraction and refining. For instance, phase changes from gas to liquid (condensation) and liquid to gas (evaporation) are common in the industry, governed by the principles of thermodynamics. 4. Reservoir Physics: Thermodynamic helps in understanding and modeling reservoir behaviors. Using different physical principles can predict how the reservoir will react to different drilling and extraction strategies, which can optimize the production strategy. 5. Materials Science: Thermodynamic also impacts the materials used in the petroleum industry. From the metallurgy of drill bits to the design of pipelines that can withstand extreme pressures and temperatures, an understanding of the physical properties of materials is essential. In summary, Thermodynamic principles are fundamental to the petroleum industry, impacting everything from the initial exploration of oil and gas deposits to the extraction and refining of these resources..
Indicative Contents المحتويات الإرشادية	Reservoir Physics: Thermodynamic helps in understanding and modeling reservoir behaviors. Using different physical principles can predict how the reservoir will react to different drilling and extraction strategies, which can optimize the production strategy.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7

	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Energy in Simple Harmonic Motion, Periodic time and sinusoidal nature for SHM, Position as a Function of Time in SHM, Velocity and Acceleration as Functions of Time in SHM. Wave motion, Types of Waves and Their Speeds
Week 2	Transverse and Longitudinal Speed of Transverse Waves, Speed of Longitudinal Waves, Energy Transported by Waves, Intensity Related to Amplitude and Frequency.
Week 3	Gauge Pressure, Fluids in Motion; Flow Rate, the Equation of Continuity
Week 4	Bernoulli's Equation, quiz
Week 5	Heat, Specific Heat, Heat Transfer, Conduction
Week 6	Convection, Radiation, Coulomb's Law, Flux, Electric potential, Gauss law, Electric Charge and Electric Field, Insulators and Conductors, Semiconductors. Contact angle,
Week 7	Introduction to Temperature And Heat, Temperature and the Zeroth Law of Thermodynamics
Week 8	Heat transfer and its methods, Temperature Scales, Specific heat, Specific volume, Calorimetry
Week 9	Phases and Properties of Pure Substances, Property Diagrams for Phase-Change Processes, Thermal equilibrium, Thermal expansion
Week 10	Linear, areal and volume expansion of solid, Volume expansion of liquid and gases, Gas laws, The Ideal-Gas Equation of State.

	Quiz.
Week 11	Compressibility Factor—A Measure of Deviation from Ideal-Gas Behavior, Other Equations of State, Exergy Transfer by Work, Applications of work.
Week 12	Energy Conversion and General Energy Analysis, Energy Balance, Energy Change of a System, and Mechanisms of Energy Transfer, Thermal Energy Reservoirs, Heat Engines, Basic Considerations in the Analysis of Power Cycles, The Carnot Cycle and Its Value in Engineering
Week 13	Basic Considerations in the Analysis of Power Cycles, The Carnot Cycle and Its Value in Engineering Entropy, Entropy Change of Liquids and Solids,
Week 14	The Entropy Change of Ideal Gases Entropy, Entropy Change of Liquids and Solids, The Entropy Change of Ideal Gases
Week 15	Completion of student presentations Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Halliday, David, Robert Resnick, and Jearl Walker. *Fundamentals of physics*. John Wiley & Sons, 2013.	
Recommended Texts	Serway, R. A., & Jewett, J. W. (2018). Physics for scientists and engineers. Cengage learning.	
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information		
Module Title	**English language**	**Module Delivery**
Module Type	**Basic**	☒ **Theory**
Module Code	**UOM 120**	

ECTS Credits	**2**	☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
SWL (hr/sem)	**50**	

Module Level	1	**Semester of Delivery**	2
Administering Department	Type Dept. PE	**College**	Type College Code
Module Leader	Ali Nooruldeen Abdulkareem	**e-mail**	ali.nooruldeen@uomisan.edu.iq
Module Leader's Acad. Title	Asst. Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	the module aims to provide students with a comprehensive understanding of reading comprehension strategies, essential grammar structures, vocabulary development, and effective communication skills. By the end of the module, students should be able to read and understand various texts, use grammar structures accurately, expand their vocabulary, and communicate effectively in English.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module, students should have developed their reading comprehension skills, acquired a solid understanding of the grammar structures covered, expanded their vocabulary, and improved their speaking and listening abilities. They should be able to communicate effectively in English, understand and analyze various texts, and use idiomatic expressions and collocations appropriately.
Indicative Contents المحتويات الإرشادية	These indicative contents provide an overview of the specific areas and topics covered within the syllabus, focusing on reading comprehension, grammar structures, vocabulary development, speaking and listening skills, and assessment. The actual content and materials used may vary based on the curriculum and resources available.

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	The strategies aim to create an engaging and interactive learning environment where students can actively participate in language acquisition. The combination of explicit instruction, meaningful practice, and real-world application helps students develop their language skills effectively.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to the course and syllabus overview Reading Comprehension: Strategies for effective reading Structure Item: Present Simple (Formation and usage)
Week 2	Reading Comprehension: Main ideas and supporting details Structure Item: Present Continuous (Formation and usage)
Week 3	Reading Comprehension: Inference and critical thinking skills Structure Item: Past Simple (Formation and usage)
Week 4	Reading Comprehension: Vocabulary development and context clues Structure Item: Past Continuous (Formation and usage)
Week 5	Reading Comprehension: Summarizing and synthesizing information Structure Item: Present Perfect (Formation and usage) Quiz
Week 6	Reading Comprehension: Text organization and paragraph comprehension Structure Item: Future Simple (Formation and usage)
Week 7	Reading Comprehension: Practice with different text types (fiction, non-fiction, etc.) Structure Item: Conditional Statements (Types I, II, III)
Week 8	Reading Comprehension: Practice with longer passages and multiple-choice questions Structure Item: Indirect Questions
Week 9	Reading Comprehension: Analyzing author's tone and purpose Structure Item: Simple Statement and Definite/Indefinite Articles
Week 10	Reading Comprehension: Practice with comprehension questions and short answer responses Structure Item: Idioms (Introduction and common examples) Quiz
Week 11	Speaking and Listening Skills: Oral presentations and discussions Structure Item: Review of previously covered grammar structures
Week 12	Speaking and Listening Skills: Role-plays and debates

	Structure Item: Review and reinforcement of grammar structures
Week 13	Speaking and Listening Skills: Group discussions and problem-solving activities Vocabulary Development: Idioms and collocations (continued practice) Report due
Week 14	Vocabulary Development: Expanding vocabulary through reading and word exercises Speaking and Listening Skills: Listening comprehension activities and note-taking practice
Week 15	Final Project and Exam Preparation Completion of the project Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

<table>
<tr><th colspan="4">Module Information</th></tr>
<tr><td>Module Title</td><td colspan="2">Technical English</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Basic</td><td rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">UOM 202</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">2</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">50</td></tr>
<tr><td>Module Level</td><td>2</td><td>Semester of Delivery</td><td>1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td>Type College Code</td></tr>
<tr><td>Module Leader</td><td>Abouther Thalib Halboose</td><td>e-mail</td><td>abouther@uomisan.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Lecturer</td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td>1.0</td></tr>
</table>

<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>All fundamental courses</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The aim of this module is to improve the technical English language skills of students in the field of petroleum engineering. The primary focus will be on developing proficiency in reading, writing, speaking and listening to technical content related to petroleum engineering. This module will also provide an understanding of the specific language used in the field and how to communicate effectively with other professionals.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this module, students should be able to: 1. Understand and use technical vocabulary related to petroleum engineering. 2. Read and comprehend technical texts related to petroleum engineering. 3. Write technical reports and documents in a clear and concise manner. 4. Speak confidently about technical topics related to petroleum engineering. 5. Listen and understand technical discussions related to petroleum engineering.
Indicative Contents المحتويات الإرشادية	1. Introduction to technical English in petroleum engineering 2. Technical vocabulary and terminology used in petroleum engineering 3. Reading and comprehension of technical texts related to petroleum engineering 4. Writing technical reports and documents in a clear and concise manner 5. Developing effective presentation skills for technical topics 6. Listening and understanding technical discussions related to petroleum engineering 7. Roleplay and simulations for technical communication in petroleum engineering 8. Case studies and problem-solving exercises.

Learning and Teaching Strategies

استراتيجيات التعلم و التعليم

Strategies	When it comes to learning and teaching technical English for petroleum engineering, there are several effective strategies that can be employed. Here are some suggestions: 1. Vocabulary Building: Emphasize the importance of petroleum engineering-specific vocabulary. Teach students industry-specific terminology, technical terms, and abbreviations commonly used in the field. Use real-world examples and case studies to reinforce vocabulary usage. 2. Reading Materials: Provide students with technical articles, research papers, industry reports, and manuals related to petroleum engineering. Encourage students to read and analyze these materials to improve their technical reading comprehension and understanding of industry-specific concepts. 3. Writing Practice: Assign writing tasks that require students to explain complex petroleum engineering concepts, write technical reports, or summarize technical research. Provide feedback and guidance to help students improve their technical writing skills. 4. Speaking and Listening Activities: Incorporate role-plays, discussions, and debates that focus on petroleum engineering topics. Encourage students to practice effective communication skills, such as presenting technical information, participating in meetings, and delivering presentations. 5. Field Trips and Guest Speakers: Organize field trips to petroleum engineering sites, such as drilling or refining facilities, to give students exposure to real-world applications. Invite guest speakers from the industry to share their experiences and insights, allowing students to interact with professionals and learn about the language used in the field. 6. Multimedia Resources: Utilize multimedia resources, such as videos, podcasts, and interactive online modules, to engage students and provide them with visual and auditory learning opportunities. These resources can cover topics like reservoir engineering, drilling techniques, or petroleum production processes. 7. Language Practice: Incorporate language-focused activities, such as grammar exercises or language games, to reinforce technical English skills. Tailor these activities to address common language challenges faced by petroleum engineering students, such as using prepositions accurately or understanding technical phrasal verbs. 8. Collaborative Projects: Assign group projects that require students to work together to solve petroleum engineering-related problems or scenarios. This encourages collaboration, critical thinking, and language practice within the context of the field. Remember, adapting teaching strategies to the needs and proficiency levels of students is crucial. Provide ample opportunities for practice, feedback, and individualized support to help students develop their technical English skills effectively.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	48	**Structured SWL (h/w)**	2

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	2	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Analysis and function of the elements contained in sentences and clauses
Week 2	Analysis and function of the elements contained in sentences and clauses
Week 3	An international industry 1. Reading: An international company

	2. Language spot (a, an, the) 3. Vocabulary: Tools and hardware 4. Pronunciation
Week 4	Upstream 1. Speaking: Talking about jobs 2. Writing: Spelling: e - the most common letter 3. Language spot: do and does, and wh- questions 4. Vocabulary: Some upstream jobs
Week 5	Downstream 1. Reading: Background 2. Number talk: Calculating 3. Language spot: Present Continuous 4. Vocabulary: Computers and control panels
Week 6	Safety first 1. Reading: Safety signs 2. Number talk: Weights and measures 3. Language spot: Modal verbs: can and must 4. Vocabulary: which kind of word
Week 7	Mid-term Exam
Week 8	Finding oil and gas 1. Reading: Seismic exploration 2. Writing: Writing sentences 3. Vocabulary: Some science 4. Number talk: Global positioning
Week 9	Drilling 1. Reading: A drilling crew 2. Language spot: Adjective forms 3. Vocabulary: Understanding instructions 4. Speaking: Giving safety advice
Week 10	Working offshore 1. Number talk: Measuring and adjusting variables 2. Reading: A production platform 3. Language spot: Countable and uncountable nouns, Comparative sentences 4. Vocabulary: Electricity and circuits
Week 11	Oil and the environment

	1. Writing: An environmental incident report, an informal email asking for information 2. Language spot: Past Simple be 3. Vocabulary: Preventing and dealing with eco-hazards and incidents 4. Reading: Preventing environmental damage
Week 12	Writing technical reports for 1. geology lab 2. drilling lab 3. fluid mechanics lab 4. reservoir engineering lab
Week 13	Punctuation
Week 14	Natural gas 1. Vocabulary: Gas production and distribution 2. Number talk: Talking about a bar chart, line graph, a pie chart
Week 15	The refinery 1. Reading: Fractional distillation 2. Writing: Explaining a process 3. Number talk: Temperature
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Oil and Gas, Level 1 - Lewis Lansford, D'Arcy Vallance**	online
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**

Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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	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.

MODULE DESCRIPTION FORM

Module Information				
Module Title	Structural Geology		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	PE 211			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	2		Semester of Delivery	1
Administering Department	Type Dept. PE		College	Type College Code
Module Leader	Fadhil Kassim Jabbar		e-mail	drfkjabbar@uomisan.edu.iq
Module Leader's Acad. Title	An adjunct instructor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/10/2024		Version Number	1.0

Relation with other Modules			
Prerequisite module	Sedimentology and Stratigraphy	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	Structural Geology: Structural geology is a module within the petroleum engineering department that focuses on the study of geological structures and their significance in the exploration and production of hydrocarbons. It explores the deformation and tectonic processes that have shaped the Earth's crust and their implications for the distribution and behavior of subsurface

	reservoirs. The Structural Geology module provides petroleum engineering students with a fundamental understanding of geological structures and their importance in hydrocarbon exploration and production. It enables them to analyze and interpret subsurface data, assess reservoir potential, and make informed decisions regarding well placement, drilling operations, and reservoir management. Within structural geology, which is the main focus of the course, you will learn in-depth about geological structures that form in different tectonic regimes, the process of their formation, their geometry, and their physical properties. The course also consists of a practical module where you will learn to measure and analyze these structures both in the field and in the laboratory.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students will learn theory of stress and deformation of rocks, classification and formation of geological structures, such as faults, folds, foliations, and lineations, and about the formation of geological structures in different tectonic regimes and conditions. Moreover, students can define the stress and strain and can relate these to the geometry of folded and faulted regions

Learning and Teaching Strategies	
Strategies	After taking this course, students should be able to: ➢ Differentiate between tectonic and structural geology topics. ➢ Know the structural set-up of different tectonic regimes. ➢ Know the brittle, ductile and plastic deformation. ➢ Understand deformation mechanisms at micro- and macro-scales. ➢ Describe the geometry and properties of different deformation structures. ➢ Run structural fieldwork and use structural field data in geometrical and kinematic analyses. ➢ Visualize and interpret structural observations and measurements with the help of stereonets. ➢ Interpret geological maps and profiles and use stereographic projection to solve structural geologic problems. ➢ Use digital tools such as compass, stereonet, GPS to collect and interpret data.

Student Workload (SWL)

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Structural Geology The Earth is a Dynamic Planet Understanding Plate Tectonic Theory Why is structural geology important?

Week 2	The Fundamental Structures Categories of Geological Structures Contacts between Rock Bodies Primary Structures Secondary Structures
Week 3	Dynamic Analysis of Stress Force, stress, and strength Types of stresses Shear Stress and Normal Stress The Fundamental Equations for Stress Calculation of Lithostatic Stress Overburden Stress Mohr Circle for Stress Quiz
Week 4	Kinematic Analysis of Strain Rock Deformation Types of Deformation Controls on Deformation of a Rock Progressive Deformation
Week 5	Kinematic Analysis of Strain Components of Kinematics Analysis Deformation and strain Types of strain Fundamental Strain Equations Pure and Simpler Shear Strain
Week 6	Kinematic Analysis of Strain Mohr Strain Diagram

	Homogenous Strain Special Types of Homogenous Strain Relationship Between Stress and Strain Limitation of The Concept of Stress in Structural Geology
Week 7	Mohr-Coulomb failure Compressive Strength Tests Tensile strength tests with no confining pressure Determining Failure Envelope Quiz
Week 8	Mohr-Coulomb failure Coulomb Law of Failure Byerlee's Law Von Mises failure envelope Effect of pore-fluid pressure
Week 9	Joints and Shear Fractures Joints Classification of joints Importance of Joints Modes of fractures
Week 10	Joints and Shear Fractures Origin of Joints Joint Systems Categories of Joints Fracture Analysis Dynamic interpretation of fractures Conjugate shear fractures
Week 11	Faults

	Types of Faults Normal and Detachment Faults Reverse and Thrust Faults Quiz
Week 12	Faults Strike-Slip Faults Oblique slip faults Grabens and Horsts
Week 13	Folds and Folding Geometric Features of a Fold Fold Classification Anticlines and Synclines Geometry of the Fold
Week 14	Folds and Folding Fold Systems Special fold types (Chevron Folds) Dynamics of Folding Kinematic Models of Folding
Week 15	Final Project and Exam Preparation Completion of a Structural Geology project Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Orientation of Structures (Strike and dip measurements)
Week 2	Lab 2: Drawing Geological Cross Section Profile and Interpretation of Geological Maps
Week 3	Lab 3: Geometric Methods: Attitude Calculations Using Three-Point Problems
Week 4	Lab 4: Geometric Methods: Dimension Calculations
Week 5	Lab 5: Stereographic Projections (Stereonets): Angles between Lines and Planes
Week 6	Lab 6: Calculation of Layer Attitude in Drill Holes
Week 7	Lab 7: Analysis of Data from Rock-Deformation Experiments

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	*Structural Geology. Twiss and Moores (2007) (2nd Edition). W.H. Freeman and Company.*	No
Recommended Texts	*STRUCTURAL GEOLOGY: An Introduction to Geometrical Techniques, Donald M. Ragan, 2009, Cambridge University Press, 632 pp.*	No
Websites	https:// https://petrowiki.spe.org/Structural_geology	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information					
Module Title	**MATHEMATICS 4**		**Module Delivery**		
Module Type	Basic		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**		
Module Code	**ENG 202**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**		2
Administering Department	Mech. Department		**College**	Engineering College	
Module Leader	Ali AL-MALIKI		**e-mail**	ali.al-maliki@uomisan.edu.iq	
Module Leader's Acad. Title	Teacher Assistant		**Module Leader's Qualification**	M.Sc.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	Applied Mathematics II	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	1. Be educated on Mathematics methods. 2. Know the procedure of calculations. 3. Develop students understanding of useful Mathematics methods

	in engineering calculations. 4. Studying and solve applications using Mathematics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The main outcome is a student have the knowledge of useful mathematics methods makes him deal with the problems, applications and calculations in different branches of science in Petroleum engineering

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the examples and exercises, while at the same time refining and expanding their logical thinking skills. This will be achieved through classes, interactive tutorials and by considering solving of simple applications.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	3	15% (15)	5, 8, 14	All

assessment	**Assignments**	2	10% (10)	6, 11	All
	Homework	2	10% (10)	3, 13	All
Summative assessment	**Midterm Exam**	2 hr	15% (15)	10	All
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	**Chapter One: PARTIAL DERIVATIVES** • Functions of Several Variables • Graphing a Function of Two Variables • Partial Derivatives
Week 2	**Chapter One: PARTIAL DERIVATIVES** • Second Order Partial Derivatives • The Chain Rule
Week 3	**Chapter One: PARTIAL DERIVATIVES** • Directional Derivatives and Gradient Vectors • Homework
Week 4	**Chapter One: PARTIAL DERIVATIVES** • Gradients and Tangents to Level Curves • Functions of Three Variables
Week 5	**Chapter One: PARTIAL DERIVATIVES** • Extreme Values and Saddle Points • Quiz.
Week 6	**Chapter One: PARTIAL DERIVATIVES** • Lagrange Multipliers • Assignment
Week 7	**Chapter Four: MULTIPLE INTEGRALS** • Double and Iterated Integrals over Rectangles

	• Double Integrals over General Regions
Week 8	**Chapter Four: MULTIPLE INTEGRALS** • Finding Limits of Integration • Properties of Double Integrals • Area by Double Integration • Quiz
Week 9	**Chapter Two: MULTIPLE INTEGRALS** • Double Integrals in Polar Coordinates • Finding Limits of Integration • Area in Polar Coordinates • Changing Cartesian Integrals into Polar Integrals
Week 10	**Chapter Two: MULTIPLE INTEGRALS** • Triple Integrals • Midterm.
Week 11	**Chapter Three: INFINITE SEQUENCES AND SERIES** • Introduction, Convergence and Divergence Test • Assignment
Week 12	**Chapter Three: DIFFERENTIAL EQUATIONS** • Fundamental Definitions • Solutions of First Order : variable separable • Solutions of First Order : exact
Week 13	**Chapter Three DIFFERENTIAL EQUATIONS** • Solutions of First Order : linear • Solutions of First Order : Bernoulli • Homework
Week 14	**Chapter Three: DIFFERENTIAL EQUATIONS** • Introduction to Solutions of second Order: Linear equation with constant coefficients, linear homogeneous equations with constant coefficients • Quiz.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	George B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano - Thomas's calculus	
Recommended Texts	1. H.K. Dass - Advanced Engineering Mathematics-S Chand & Co Ltd (2007)	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

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معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="2">Electrical Engineering Technology</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Basic</td><td rowspan="5">☒ Theory
☒ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">PE 212</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">125</td></tr>
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<tr><td>Module Level</td><td>2</td><td>Semester of Delivery</td><td>1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td>Type College Code</td></tr>
<tr><td>Module Leader</td><td>Nsaif Jasim</td><td>e-mail</td><td>D.alhumairi@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Professor</td><td>Module Leader’s Qualification</td><td></td></tr>
<tr><td>Module Tutor</td><td>Nsaif Jasim</td><td>e-mail</td><td>nsf_jsm@uomisan.edu.iq</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td>1.0</td></tr>
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<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	- فهم ومعرفة دوائر التيار المستمر -التعرف على رموز الدوائر الكهربائية للتيار المستمر. -تطوير مهارات الطالب في استخدام طرق التحليل و نظريات الشبكات. - تطوير التفكير المجرد، المنطقي والناقد والقدرة على التفكير بشكل حاسم على عملهم وعمل الآخرين
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**أ الأهداف المعرفية** -التعرف الرموز و المصطلحات الأساسية للهندسة الكهربائية. -التعرف أساسيات دوائر التيار المستمر. -معرفة كيفية استخدام طرق التحليل. -معرفة نظريات الشبكات الكهربائية. -التعرف على حل الدوائر الكهربائية باستخدام طرق التحليل ونظريات الشبكات. **ب الأهداف المهاراتية الخاصة بالمقرر** -التعرف على حل مشاكل الدوائر الكهربائية المتعلقة. -التعرف على استخدام الحاسبات العلمية المتقدمة . -التعرف على كيفية استخدام أقصر الحلول في الهندسة الكهربائية . -التعرف على كيفية إيجاد الحل للمشاكل الهندسية باستخدام طرق التحليل.
Indicative Contents المحتويات الإرشادية	زيادة المعرفة للمسؤولية المهنية والأخلاقية للمهندس. القدرة على التواصل بشكل فاعل تأثير الحلول الهندسية في السياق الاقتصادي والبيئي والاجتماعي خلق روح مواصلة التعلم ومواكبة التطورات العلمية في مجال العمل القدرة على استخدام التقنيات والمهارات والأدوات الهندسية الحديثة اللازمة لممارسة مهنة الهندسة.

Learning and Teaching Strategies	
Strategies	

الطريقة الألقائيه الطريقة الحوارية الطريقة الناشطة (تعتمد على نشاط الطالب)	

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to D.C circuits Elect. Quantities Charge Elect. Force
Week 2	Conductors and insulators Current Elect. potential and voltage Energy and power
Week 3	Fundamentals of elect. Circuits Resistance & resistively
Week 4	conductance & conductivity Effect of temp. on resistance Sources (voltage & current sources)
Week 5	Ohms low Kirchhoff's lows
Week 6	Principles of elect. circuits Series and parallel circuits
Week 7	Voltage divider rule Current divider rule
Week 8	Method of analysis Branch current method
Week 9	Mesh analysis
Week 10	Star-delta and delta-star conversion
Week 11	Network theorems. Superposition theory
Week 12	Source Transformation
Week 13	Thevenin's theorem

Week 14	**Norton's Theorem**
Week 15	**Maximum transfer theorem**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Introduction
Week 2	Lab 2: Kirchhoff's Voltage and Current Laws Experiment
Week 3	Lab 3: Ohms Law
Week 4	Lab 4: Open & close Circuit
Week 5	Lab 5: Superposition
Week 6	Lab 6: Thevenin's Theorem and Kirchhoff's Laws
Week 7	Lab 7: Norton's Theorem and Kirchhoff's Laws

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Past lectures	Yes
Recommended Texts	Introductory Circuit Analysis, Boylestad	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group	**A –** Excellent	امتياز	90 - 100	Outstanding Performance

(50 - 100)	**B -** Very Good	جيد جدا	80 - 89	Above average with some errors
	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	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**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.

MODULE DESCRIPTION FORM

Module Information معلومات المادة الدراسية		
Module Title	**Petroleum Properties**	**Module Delivery**
Module Type	**Core**	☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**
Module Code	**PE 214**	
ECTS Credits	**5**	
SWL (hr/sem)	**125**	

Module Level	2	**Semester of Delivery**	1
Administering Department	Type Dept. PE	**College**	Engineering College
Module Leader	Hanon Hassan Mashkor	**e-mail**	Hanon.Hassan@uomisan.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	20/06/2023	**Version Number**	1.0

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	The main aims of the Petroleum Properties module will focuses on the study of the physical and chemical properties of petroleum fluids. It is essential for petroleum engineers to understand these properties as they directly influence the behavior of hydrocarbon reservoirs and the design of production and refining processes. By studying Petroleum Properties, students gain a comprehensive understanding of the behavior and characteristics of petroleum fluids. This knowledge is crucial for making informed decisions in reservoir management, production optimization, and field development planning.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The main module learning outcomes are: 1. Define the Composition of crude oil and its classifications 2. Identify the hydrocarbon and Nonhydrocarbon Components. 3. Recognize the chemical and physical properties. 4. Define the classification methods and Evaluation of Petroleum. 5. Discuss and Analysis of Crude Petroleum and its fractions 6. Define the Important Product-Properties and Test Methods 7. Study of the experimental test of crude oil properties and its products
Indicative Contents المحتويات الإرشادية	The main indicative contents are: 1. Petroleum properties (Nature of Petroleum Fluids, Crude oil properties), 2. Characterization and Properties of Pure Hydrocarbons (classification, chemical compositions, chemical and physical properties), 3. Characterization and Properties of Pure Hydrocarbons; Density, specific gravity and coefficient of expansion, 4. Characterization and Properties of Pure Hydrocarbons; Viscosity, molecular weight, vapor pressure, 5. Characterization and Properties of Pure Hydrocarbons; Specific heat, lateen heat, heat of combustion, boiling range, flash point, pour point, 6. Prediction of the Composition of Petroleum Fractions, aniline point, penetration number, 7. Predication of PNA Composition, Elemental Composition, Other Properties, 8. Petroleum fraction and products, Soften point, crude oil evaluation, 9. Distribution functions for Properties of Hydrocarbon-plus Fractions,

	10. Fractional distribution and TBP curve, 11. Characterization of Reservoir Fluids and Crude Oils, 12. Analysis of fractions, 13. Dehydration of crude oil, 14. Nature gas properties 15. Oilfield water properties

Learning and Teaching Strategies	
Strategies	The main strategies that will be adopted in delivering this unit are: 1- Encourage students to participate in the exercises. This is achieved through classes and interactive educational programmers. 2- Improving and expanding critical thinking skills at the same time and by thinking about the type of simple experiments that include some sampling activities of interest to the students. 3-Raise students scientific and knowledge levels by employing the automatic technique, conversational approach, and active method.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 9	LO # 1, 2, 8,9 and 10
	Assignments	1	10% (10)	11	LO # 3, 4, 6, 7 and 11
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 11 and 12
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1- 7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	• Introduction of petroleum properties (Nature of Petroleum Fluids, Crude oil properties)
Week 2	• Characterization and Properties of Pure Hydrocarbons (classification, chemical compositions, chemical and physical properties)
Week 3	• Density, specific gravity and coefficient of expansion.
Week 4	• Viscosity, molecular weight, vapor pressure.
Week 5	• Specific heat, lateen heat, heat of combustion, boiling range, flash point, pour point. • **Quiz**
Week 6	• Prediction of the Composition of Petroleum Fractions, aniline point, penetration number.
Week 7	• Predication of PNA Composition, Elemental Composition, Other Properties • **Mid- Term Exam**
Week 8	• Petroleum fraction and products, Soften point, crude oil evaluation.
Week 9	• Distribution functions for Properties of Hydrocarbon-plus Fractions

	• **Quiz**
Week 10	• Fractional distribution and TBP curve.
Week 11	• Characterization of Reservoir Fluids and Crude Oils
Week 12	• Analysis of fractions
Week 13	• Dehydration of crude oil
Week 14	• Nature gas properties
Week 15	• Oilfield water properties
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Relative density measurement for crude oil Experiment
Week 2	Lab 2: Flash point Experiment
Week 3	Lab 3: smoking point Experiment
Week 4	Lab 4: soften point Experiment
Week 5	Lab 5: Aniline point Experiment
Week 6	Lab 6: Radiation Heat Transfer Experiment
Week 7	Lab 7: Freezing point Experiment
Week 8	Lab 8: Melting point Experiment
Week 9	Lab 9: Ash Experiment
Week 10	Lab 10: TDS Experiment
Week 11	Lab 11: Partial distillation of crude oil
Week 12	Lab 13:Review
Week 13	Lab 14:Examination

Week 14	Lab 15:Final examination

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1-*Text of lectures* 2- *Riazi, M. R. Characterization and properties of petroleum fractions. Vol. 50. ASTM international, 2005.*	Yes
Recommended Texts	1- Properties of Petroleum Fluids 3rd Edition by William McCain.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information				
Module Title	Fluid Mechanics I		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	PE 213			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	2	Semester of Delivery	1	
Administering Department	Type Dept. PE	College	Type College Code	
Module Leader	Abouther Thalib Halboose	e-mail	abouther@uomisan.edu.iq	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.	
Module Tutor	Name (if available)	e-mail	E-mail	
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	1/10/2024	Version Number	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Drilling Engineering, Reservoir Engineering, production Engineering	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Introduce basic definitions and introductory concepts of fluid mechanics. 2. Introduce the description of pressure distribution in a static fluid

	3. Introduce the description of phenomena associated with measuring static pressure in oil well and fluid mechanics applications in Petroleum Engineering. 4. Introduce Explain and derive the conservation laws that govern fluid motion (continuity, energy, and momentum equations). 5. Drive Bernoulli's Equation and its applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define Fluids and Fluid Mechanics and distinguish between incompressible and compressible fluids, and understand and define the basic fluid properties; especially density and viscosity, and apply Newton's law of viscosity. 2. Calculate; the pressure in static fluid and understand how can calculate the static pressure in oil and gas well. 3. Understand the types of fluid and what are the Newtonian and non-Newtonian fluid 4. Be familiar with continuity, energy, and momentum equations, and their applications to fluid mechanics problems. 5. Be able to apply modern knowledge and to apply mathematics, science, engineering and technology to fluid mechanics problems and applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Definition of fluid, Units and dimensions (Systems of units) the centimetre-gram-second (cgs) system, the metre-kilogram-second (mks system and the Systeme International d'Unites (SI), British engineering system, Properties of fluid (Viscosity, Newtonian, non-Newtonian, density, surface tension, capillary Fluid static, Pascal law, Variation of pressure of a fluid at rest, Measurement of Pressure (Absolute pressure, Gauge pressure, Vacuum pressure), Manometer (mercury barometer, piezometer tube, the U-tube manometer, and the inclined-tube manometer), Pressures in oil and gas well General Conservation Laws, Steady-state mass balance for fluid flow, Energy Balances, Bernoulli's Equation, The Energy Line and the Hydraulic Grade Line, Application of use Bernoulli equation Free jet, Spraying Water into the Air, Siphoning Out Gasoline from a Fuel Tank, Measurement (Velocity Measurement by a Pitot Tube, the orifice meter, the nozzle meter, and the Venturi meter)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Fluid mechanics is an important area of study in physics and engineering. There are several learning and teaching strategies that instructors can use to help facilitate student understanding

	of this complex topic. Here are a few: Hands-on experience: One of the best ways to learn about fluid mechanics is through hands-on experiences. Students can conduct experiments, work on projects, and participate in simulations that allow them to directly see the principles of fluid mechanics in action. Visual aids: Another effective teaching strategy is the use of visual aids such as animations, diagrams, and videos. These can help to illustrate complex concepts in a more easily understandable way. Active learning: Active learning strategies, such as group work and problem-based learning, can help students to better understand fluid mechanics by encouraging them to interact with the material and each other. Real-world examples: Using real-world examples can be a very effective teaching strategy in fluid mechanics. Students can better understand how these principles are applied in real life and this can help to increase their engagement and understanding. Concept mapping: Concept mapping is a teaching strategy where students create visual representations of their understanding of a particular topic. This can be particularly effective in fluid mechanics as it can help students to better understand the relationships between different concepts

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introductory concepts to fluid mechanics
Week 2	Units and dimensions
Week 3	Properties of fluids
Week 4	Types of fluid (Newtonian and non-Newtonian fluids)
Week 5	Fluid statics: pressure distribution in static fluids
Week 6	Pressure measurements
Week 7	Mid-term Exam
Week 8	Fluid statics: application in petroleum Engineering
Week 9	Steady-state mass balance for fluid flow
Week 10	Energy Balances
Week 11	Bernoulli's Equation

Week 12	The Energy Line and the Hydraulic Grade Line
Week 13	Application of use Bernoulli equation
Week 14	Measurement of velocity
Week 15	Momentum balance
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	**Fundamentals of Fluid Mechanics by Munson**	online
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

<table>
<tr><th colspan="6">Module Information</th></tr>
<tr><td>Module Title</td><td colspan="3">Engineering Ethics</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Basic</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 223</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td>Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td colspan="2">2</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Mudhaffar Yacoub Hussein</td><td>e-mail</td><td colspan="3">myhussein2017@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="3">1.0</td></tr>
</table>

<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>Ethics in petroleum engineering involves considering the moral and social implications of activities and decisions made within the industry.</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td></td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	Course Aims: - To enhance students' analytical, critical, and creative thinking skills in relation to ethical issues in engineering. - To familiarize students with classic cases in engineering ethics and typical ethical and professional issues that arise in engineering. - To train students in analyzing complex problems and finding ethical resolutions
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Learning Outcomes: - Develop the ability to identify and evaluate ethical issues in engineering. - Apply ethical frameworks and principles to engineering decision-making. - Demonstrate an understanding of the relationship between ethics and the law in engineering. - Analyze and solve ethical dilemmas in engineering practice. - Communicate ethical considerations effectively in written and oral forms.
Indicative Contents المحتويات الإرشادية	1. What's meant by Ethics? 2. Why should a future engineer bother studying ethics at all? 3. Engineering is managing the unknown. 4. Engineering design is about creating new devices and products. - How well does it work? - How will it affect people? - What changes will this lead to in society? - How well will this work under all of the conditions that it will be exposed to? - Is it safe? If there are some safety concerns, how bad are they? 5. Difference Between Personal and Professional Ethics.

	6. Ethics and the Law. 7. Ethical problems.

Learning and Teaching Strategies	
Strategies	Teaching Strategies for the Course: - Case studies and real-world examples to illustrate ethical dilemmas in engineering. - Group discussions and debates to encourage critical thinking and perspective sharing. - Ethical decision-making frameworks and tools for analyzing and resolving ethical problems. - Guest lectures from industry professionals to provide practical insights. - Assignments and projects requiring ethical analysis and reflection. - Role-playing exercises to simulate ethical scenarios and decision-making processes. Please note that these points are based on the provided keywords and may require further refinement and elaboration when developing the actual course material.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	• Introduction to Course Materials.
Week 2	• The Profession of Engineering. 1
Week 3	• The Profession of Engineering. 2
Week 4	• Professionalism and Codes of Ethics. 1
Week 5	• Professionalism and Codes of Ethics. 2 • Quiz
Week 6	• Understanding Ethical Problems. 1
Week 7	Midterm Exam
Week 8	• Understanding Ethical Problems. 2

Week 9	• Ethical Problem-Solving Techniques. 1
Week 10	• Ethical Problem-Solving Techniques. 2 • Quiz.
Week 11	• Risk, Safety, and Accidents.
Week 12	• The Rights and Responsibilities of Engineers. 1
Week 13	• The Rights and Responsibilities of Engineers.2 .
Week 14	• Ethics in Research and Experimentation.
Week 15	• Global Issues. • Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Charles B. Fleddermann, “Engineering Ethics”, Fourth Edition,2012, Pearson Education, Inc., publishing as Prentice Hall, 1 Lake Street, Upper Saddle River, NJ 07458,USA. 2- Charles B. Fleddermann, “Engineering Ethics”,Thired Edition, 2008 , Pearson Education, Inc., publishing as Prentice Hall, 1 Lake Street, Upper Saddle River, NJ 07458,USA. 3-Naagarazan R.S., “A Textbook on Professional Ethics and Human Values”,2006, New Age International (P) Ltd., Publishers, New Delhi, India.	No
Recommended	1-Charles E. Harris, Michael S. Pritchard, Michael J. Rabins, “Engineering Ethics, Concepts and Cases”,	No

Texts	Fourth Edition, 2009,Wadsworth, USA.	
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

<table>
<tr><th colspan="6">Module Information</th></tr>
<tr><td>Module Title</td><td colspan="3">Fundamentals of Petroleum Engineering</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="5">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 222</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td colspan="2">2</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Ali Nooruldeen Abdulkareem</td><td>e-mail</td><td colspan="3">ali.nooruldeen@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Lecturer</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="3">1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	The aims provide a broad overview of the intended learning outcomes for the course, which aim to equip students with a solid foundation in petroleum engineering principles, techniques, and industry practices.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	These module learning outcomes reflect the desired knowledge, skills, and competencies that students should develop throughout the course in order to become competent petroleum engineering professionals.
Indicative Contents المحتويات الإرشادية	The indicative contents provide an overview of the key topics and areas of study that would be covered in a course on petroleum engineering. The specific depth of coverage and additional subtopics can be tailored based on the course duration and desired learning outcomes.

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	In a course on petroleum engineering, various strategies can be implemented to enhance student learning and engagement. Here are some strategies that can be employed: Active Learning: Incorporate active learning strategies such as problem-based learning, case studies, group discussions, and hands-on exercises. This allows students to apply their knowledge, solve problems, and engage with the material actively. Practical Assignments: Assign practical projects and assignments that simulate real-world petroleum engineering tasks. This can include reservoir simulation exercises, well design projects, or data analysis from well logs and production data. By implementing these strategies, educators can create an engaging and comprehensive learning environment for students studying petroleum engineering. By implementing these strategies, educators can create an engaging and comprehensive learning environment for students studying petroleum engineering.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	• Introduction to Petroleum Engineering • • Elements of petroleum engineering • Overview of the oil and gas industry

	• Origin of petroleum and formation of hydrocarbon reservoirs
Week 2	• Reservoir Rock Properties and Fluid Distribution • • Rock properties: porosity, permeability, and lithology • Fluid distribution within reservoirs • Saturation calculations and reservoir characterization
Week 3	• Volumetric Calculations of Oil in Place • • Estimating hydrocarbon reserves • Material balance equations and calculations • Introduction to reservoir simulation concepts
Week 4	• Natural Forces in Oil and Gas Reservoirs • • Reservoir pressure and temperature considerations • Fluid flow mechanisms: Darcy's law and fluid displacement • Capillary pressure and relative permeability
Week 5	• Oil Exploration Methods and Techniques • Geologic surveys and mapping • Seismic exploration and interpretation • Well log analysis for prospect evaluation • Quiz
Week 6	• Week 6: Rotary Drilling Principles and Techniques • Drilling rig components and their functions • Drilling fluids and their properties • Drilling bits and their selection
Week 7	• Casing Design and Installation • Casing types and sizes • Casing design considerations • Casing installation techniques and procedures
Week 8	• Cementing Operations • Cementing objectives and principles • Cementing materials and additives • Cementing process and quality control
Week 9	• Well Completion Techniques and Equipment • Wellhead equipment and its functions • Tubing and packer installation

	• Perforation techniques and considerations
Week 10	• Introduction to Well Logging • Well logging principles and objectives • Open-hole logging tools and interpretation • Logging while drilling (LWD) techniques • Quiz
Week 11	• Wireline Logging Tools and Interpretation • Introduction to wireline logging • Logging tool functions and measurements • Interpretation of logging data for formation evaluation
Week 12	• Formation Evaluation and Reservoir Characterization • Rock properties determination from logging data • Petrophysical analysis and interpretation • Reservoir characterization techniques
Week 13	• Artificial Lift Methods • Principles and types of artificial lift • Pumping systems: sucker rod pumps, electric submersible pumps (ESPs) • Gas lift systems and optimization • Report due
Week 14	• Field Development Planning and Case Studies • Reservoir management principles • Field development planning considerations • Case studies from Iraqi oil fields or other relevant examples
Week 15	• Final Project and Exam Preparation • Completion of the project • Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts		Yes
Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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
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	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.

MODULE DESCRIPTION FORM

Module Information				
Module Title	**Petroleum Geology**		**Module Delivery**	
Module Type	**Core**		☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**PE 221**			
ECTS Credits	**5**			
SWL (hr/sem)	**125**			
Module Level	2		**Semester of Delivery**	2
Administering Department	Type Dept. PE		**College**	Type College Code
Module Leader	Fadhil Kassim Jabbar		**e-mail**	drfkjabbar@uomisan.edu.iq
Module Leader's Acad. Title	An adjunct instructor		**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail
Peer Reviewer Name	Name		**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024		**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Sedimentology and Stratigraphy	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	Petroleum Geology: The module on Petroleum Geology focuses on the study of subsurface geological formations to identify and evaluate potential oil and gas reservoirs. It combines principles of geology, sedimentology, stratigraphy, and structural geology to understand the origin, distribution, and characteristics of hydrocarbon deposits. This module is designed to describe the different elements and processes that constitute the Petroleum system. The module presents the origin, types and characteristics of source rocks. It Contains the reservoir rocks and their properties to evaluate the reservoir potential prior to exploration and development of petroleum. The hydrocarbon migration and accumulation and entrapment style are also included in this course. The Petroleum Geology module provides students with the necessary knowledge and skills to understand the geological aspects of hydrocarbon exploration and production. By studying the subsurface geology, students can contribute to the identification and development of viable oil and gas reserves, supporting the overall field development and production operations in the petroleum industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Two main strands are followed during the course of this module. Firstly, the principal theoretical concepts of petroleum generation, migration, and accumulation, as well as oil exploration are introduced. Sessions each week will consist of lectures to present new theoretical material followed by practical sessions in which to apply various investigative techniques, including; drilling, well log interpretation, well correlation and basin modelling, sequence stratigraphy and seismic interpretation.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies	
Strategies	On successful completion of this module, a student will be expected to be able to: - Understand the history of petroleum and hypothesis of generation

	-Explain the dynamics of a system to generate and accumulate oil and gas - Evaluate source rock potential and hydrocarbon potentiality - Characterize reservoir rocks, calculate porosity, permeability and saturation - Identify different types of oil traps and how they are formed -Visualize the petroleum system in order to identify migration pathways of hydrocarbon and predict the most suitable traps for accumulation - appraise the hydrocarbon potentiality and calculate the reserve in place

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to petroleum Geology • Overview of the petroleum system • Origin of Petroleum
Week 2	Methods of Petroleum Exploration • Geophysical and Geochemical Methods • Borehole Geophysics and 4D Seismic • Subsurface Geology and Remote Sensing • Formation Evaluation • Subsurface Geological Mapping
Week 3	Generation of Petroleum • Production of Organic Matter • Accumulation of Organic Matter
Week 4	Formation of Kerogen • Stages of Transformation of Organic Matter • Diagenesis, Catagenesis, Metagenesis • Types of Kerogen • Quiz
Week 5	Petroleum Source Rocks • Total Organic Carbon (TOC) • Thermal Maturation and Thermal maturation indicators • Types of Thermal Maturity Modeling
Week 6	The Reservoir Rocks • Porosity and Permeability • Capillary Pressure and Multi-phase fluid flows • Wettability and Wettability Index and Measurements • Texture of Reservoir Rocks
Week 7	The Reservoir Rocks • Effects of Diagenesis on Reservoir Quality • Hydrostatic/Lithostatic pressure gradient • Reservoir Rock Compressibility • Reservoir Continuity

	• Reservoir Characterization
Week 8	The Reservoir Rocks • Reserve Calculation • Production Methods • Quiz
Week 9	Petroleum Migration and Accumulation • Phases of Petroleum Migration • Mechanisms of Petroleum Migration • Primary migration and Secondary migration
Week 10	Hydrocarbon Traps and Seals • Elements of a Hydrocarbon Trap • Types of Hydrocarbon Traps
Week 11	Hydrocarbon Traps and Seals • Distribution of Petroleum within a Trap • Types of Hydrocarbon Traps in Iraq • Seals and Cap Rocks • Quiz
Week 12	Sedimentary Basins & Petroleum Systems • Basic Concepts • Mechanisms of Basin Formation • Classification of Sedimentary Basins
Week 13	Sedimentary Basins & Petroleum Systems • Distribution of Hydrocarbons in different types of basins • Basins and Petroleum System • Sedimentary Basins and Petroleum system of Iraq
Week 14	Physical & Chemical Properties of Petroleum • Characteristics of Crude Oil • Natural Gases
Week 15	Final Project and Exam Preparation Completion of a Petroleum Geology project Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Lithostratigraphic Correlation
Week 2	Lab 2: Well Log Correlation
Week 3	Lab 3: Overview of Seismic Stratigraphy and Interpretation
Week 4	Lab 4: Direct Hydrocarbon Indicator (DHI) Mapping
Week 5	Lab 5: Modeling Source Generation and Analyzing a potential source rock
Week 6	Lab 6: Generating an Isochron Map
Week 7	Lab 7: Fault Seal Analysis and Hydrocarbon Charge

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	*Elements of Petroleum Geology*, 2nd ed., Richard Selley (Academic Press, 2nd edition 1998; 3rd edition 2014)	No
Recommended Texts	*The Petroleum Geology of Iraq*, A. A. M. Aqrawi, J. C. Goff, A. D. Horbury and F. N. Sadooni, ISBN: 978-0-901360-36-8 424 pages *Petroleum Geology*, North F. K., 1985, Allen & Unwin Publishing. Very good reference book on petroleum geology overall. Excellent examples, especially for the North Sea *Sedimentary Basins and Petroleum Geology of the Middle East*, 1997, A.S. Alsharhan, A.E.M. Nairn	No
Websites	https://www. https://wiki.aapg.org/Main_Page	

Grading Scheme

مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

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<tr><td>Module Code</td><td colspan="3">ENG 202</td></tr>
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<tr><td>SWL (hr/sem)</td><td colspan="3">125</td></tr>
<tr><td>Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td colspan="2">2</td></tr>
<tr><td>Administering Department</td><td>Mech. Department</td><td>College</td><td colspan="3">Engineering College</td></tr>
<tr><td>Module Leader</td><td>Ali AL-MALIKI</td><td>e-mail</td><td colspan="3">ali.al-maliki@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Teacher Assistant</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">M.Sc.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td></td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
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<tr><th colspan="4">Relation with other Modules</th></tr>
<tr><td>Prerequisite module</td><td>Applied Mathematics II</td><td>Semester</td><td>2</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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<table>
<tr><th colspan="2">Module Aims, Learning Outcomes and Indicative Contents</th></tr>
<tr><td>Module Aims
أهداف المادة الدراسية</td><td>1. Be educated on Mathematics methods.</td></tr>
</table>

	2. Know the procedure of calculations. 3. Develop students understanding of useful Mathematics methods in engineering calculations. 4. Studying and solve applications using Mathematics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The main outcome is a student have the knowledge of useful mathematics methods makes him deal with the problems, applications and calculations in different branches of science in Petroleum engineering
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the examples and exercises, while at the same time refining and expanding their logical thinking skills. This will be achieved through classes, interactive tutorials and by considering solving of simple applications.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (15)	5, 8, 14	All
	Assignments	2	10% (10)	6, 11	All
	Homework	2	10% (10)	3, 13	All
Summative assessment	Midterm Exam	2 hr	15% (15)	10	All
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	**Chapter One: PARTIAL DERIVATIVES** • Functions of Several Variables • Graphing a Function of Two Variables • Partial Derivatives
Week 2	**Chapter One: PARTIAL DERIVATIVES** • Second Order Partial Derivatives • The Chain Rule
Week 3	**Chapter One: PARTIAL DERIVATIVES** • Directional Derivatives and Gradient Vectors • Homework
Week 4	**Chapter One: PARTIAL DERIVATIVES** • Gradients and Tangents to Level Curves • Functions of Three Variables
Week 5	**Chapter One: PARTIAL DERIVATIVES** • Extreme Values and Saddle Points • Quiz.
Week 6	**Chapter One: PARTIAL DERIVATIVES** • Lagrange Multipliers

	• Assignment
Week 7	**Chapter Four: MULTIPLE INTEGRALS** • Double and Iterated Integrals over Rectangles • Double Integrals over General Regions
Week 8	**Chapter Four: MULTIPLE INTEGRALS** • Finding Limits of Integration • Properties of Double Integrals • Area by Double Integration • Quiz
Week 9	**Chapter Two: MULTIPLE INTEGRALS** • Double Integrals in Polar Coordinates • Finding Limits of Integration • Area in Polar Coordinates • Changing Cartesian Integrals into Polar Integrals
Week 10	**Chapter Two: MULTIPLE INTEGRALS** • Triple Integrals • Midterm.
Week 11	**Chapter Three: INFINITE SEQUENCES AND SERIES** • Introduction, Convergence and Divergence Test • Assignment
Week 12	**Chapter Three: DIFFERENTIAL EQUATIONS** • Fundamental Definitions • Solutions of First Order : variable separable • Solutions of First Order : exact
Week 13	**Chapter Three DIFFERENTIAL EQUATIONS** • Solutions of First Order : linear • Solutions of First Order : Bernoulli • Homework
Week 14	**Chapter Three: DIFFERENTIAL EQUATIONS** • Introduction to Solutions of second Order: Linear equation with constant coefficients, linear homogeneous equations with constant coefficients • Quiz.

Week 15	**Chapter Three: DIFFERENTIAL EQUATIONS** • Introduction to Solutions of second Order: nonhomogeneous equations, solving of non-homogenous equations, variation of parameters
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	George B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano - Thomas's calculus	
Recommended Texts	1. H.K. Dass - Advanced Engineering Mathematics-S Chand & Co Ltd (2007)	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

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<tr><td>Module Code</td><td colspan="3">ENG 127</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td>Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td colspan="2">2</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Asst. Professor</td><td colspan="2">Module Leader's Qualification</td><td colspan="2"></td></tr>
<tr><td>Module Tutor</td><td>Nsaif Jasim</td><td>e-mail</td><td colspan="3">nsf_jsm@uomisan.edu.iq</td></tr>
<tr><td>Peer Reviewer Name</td><td>Ali dhahir</td><td>e-mail</td><td colspan="3">ali_dh11@uomisan.edu.iq</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
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<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**التعرف على البرامج المستخدمة لكتابة الاكواد بلغة ++C والماتلاب** **التعرف على اساسيات لغة ++C والماتلاب** **كيفية كتابة الجمل الشرطية وانواع الاوامر لتنفيذها** **التعرف على العمليات التكرارية واهم الاوامر المستخدمة في التكرار**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1- تنصيب البرنامج الخاص بكتابة الكود ++C وبرنامج الماتلاب Matlab** **2- معرفة الاساسيات وكيفية استدعاء المتغيرات ونوع البيانات التي يتم ادراجها** **3- معرفة استخدام الجمل الشرطية وتطبيق البرامج الخاصة بها** **4- معرفة كيفية تكرار تنفيذ الايعازات لبي انات متعددة والاوامر المستخدمة في التكرار** **5- التعرف على بعض الايعازات ذات استخدام محدد لتنفيذ امر** **6- التعرف على المكتبات المستخدمة والغرض من استدعاءها** **7- التعرف على كيفية تنفيذ العمليات المنطقية والرياضية** 8- **التعرف على كيفية الرسم في برنامج الماتلاب**
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies	
Strategies	الطريقة الألقائيه الطريقة الحوارية الطريقة الناشطة (تعتمد على نشاط الطالب)

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem)	37	**Unstructured SWL (h/w)**	2

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	**Install program of C++ & Basics of C++**
Week 2	**Arithmetic and logic operations & Input/Output program**
Week 3	**Stdio library & Public and private variables**
Week 4	**If condition & Nested if**
Week 5	**Loops (for)**
Week 6	**Loops (while) & Nested loops**
Week 7	**Install program of MATLAB**
Week 8	**Arithmetic and logic operations**

Week 9	**Input/Output functions**
Week 10	**If condition & Nested if**
Week 11	**Loops (for)**
Week 12	**Loops (while) & Nested loops**
Week 13	**2d plot**
Week 14	**3d plot**
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Install program of C++ & Basics of C++
Week 2	apply some examples on Arithmetic and logic operations & Input/Output program
Week 3	Stdio library & Public and private variables
Week 4	If condition & Nested if
Week 5	Loops (for)
Week 6	Loops (while) & Nested loops
Week 7	Writing through the editor or script
Week 8	Arithmetic and logic operations
Week 9	Input/Output functions
Week 10	If condition & Nested if
Week 11	Loops (for)
Week 12	Loops (while) & Nested loops
Week 13	2d plot
Week 14	3d plot

Week 15	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	1 C++ # موسوعة البرمجة بلغة C++ # البرمجة بلغة مع الأمثلة والتمارين	Yes
Recommended Texts	# C++ How to program/ Paul Deitel, Harvey Deitel	No
Websites	يمكن الولوج الى صفحة الموضوع او من خلال موقع الكلية **www.uomisan.edu.iq/moodle** **او** Video Portal Main Page - MATLAB & Simulink (mathworks.com)	

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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

MODULE DESCRIPTION FORM

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<tr><td>Module Leader</td><td>Muaid Kareem</td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. teacher</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Msc.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="3">1.0</td></tr>
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<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td></td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**للتعرف والاطلاع على مجموعة من الجرائم التي ارتكبها حزب البعث البائد والمنحل بحق أبناء الشعب العراقي ومن مختلف المكونات لأطيافه ولتأسيس وعي للطلبة لرفض جميع اشكال الظلم والتسلط لهذه الأنظمة والمطالبة بجميع الحقوق المدنية والسياسية**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1-تعرف الطالب على جرائم البعث وفق قانون المحكمة الجنائية العراقية,**
Indicative Contents المحتويات الإرشادية	**للتعرف على القرارات الصادرة من المحكمة الجنائية**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**القاء المحاضرات واستخدام طريقة النقاش والحوار**

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	1	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	1	LO # 3, 4, 6 and 7
	Projects / Lab.				
	Report	1	10% (10)	1	LO # 5, 8 and 10
Sumative assessment	**Midterm Exam**	2 hr	10% (10)	1	LO # 1-7
	Final Exam	3 hr	50% (50)	1	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	

Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	
Week 16	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1- Charles B. Fleddermann, "Engineering Ethics", Fourth Edition,2012, Pearson Education, Inc., publishing as Prentice Hall, 1 Lake Street, Upper Saddle River, NJ 07458,USA. 2- Charles B. Fleddermann, "Engineering Ethics",Thired Edition, 2008 , Pearson Education, Inc., publishing as Prentice Hall, 1 Lake Street, Upper Saddle River, NJ 07458,USA. 3-Naagarazan R.S., "A Textbook on Professional Ethics and Human Values",2006, New Age International (P) Ltd., Publishers, New Delhi, India.	No
Recommended Texts	1-Charles E. Harris, Michael S. Pritchard, Michael J. Rabins, "Engineering Ethics, Concepts and Cases", Fourth Edition, 2009,Wadsworth, USA.	No

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
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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.

MODULE DESCRIPTION FORM

<table>
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<tr><td>SWL (hr/sem)</td><td colspan="2">125</td></tr>
<tr><td colspan="2">Module Level</td><td>2</td><td colspan="2">Semester of Delivery</td><td>2</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. Code</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td colspan="2">Abouther Thalib Halboose</td><td>e-mail</td><td colspan="2">abouther@uomisan.edu.iq</td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td>Lecturer</td><td colspan="2">Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>Drilling Engineering, Reservoir Engineering, production Engineering</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	6. Introduce the principles of viscous flow in pipes. 7. Define the Reynold's number to introduce the laminar flow and turbulent flow 8. Introduce Moody chart 9. Introduce pumps and pumps connection. 10. Dimensional Analysis 11. Multiphase flow
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	6. Be able to know the type of flow 7. Be able to derive the velocity profile and shear stress distribution in pipes 8. Calculate frictional losses in pipe problems for both laminar and turbulent flows, by using Moody Diagram. 9. Calculate secondary (minor) losses for various pipes fittings and connections. 10. Be able to analyze and design pumping stations and connection 11. Be able to use of The Rayleigh Method in dimensional analysis 12. Apply the Buckingham pi theorem and develop a set of dimensionless variables for a given flow situation. 13. Discuss the use of dimensionless variables in data analysis. 14. Be able to apply modern knowledge and to apply mathematics, science, engineering and technology to fluid mechanics problems and applications. 15. Be able to understand the fundamental two-phase flow.
Indicative Contents المحتويات الإرشادية	Laminar and Turbulent Flows Reynolds Number, The Entrance Region, Entry Lengths Laminar Flow in Pipes, Pressure Drop and Head Loss, Effect of Gravity on Velocity and Flow Rate in Laminar Flow, Laminar Flow in Noncircular Pipes, Turbulent Flow, The Moody Chart, Major Losses, Minor Losses Dimensional Analysis, The Rayleigh Method, Buckingham Pi Theorem, Determination of Pi Terms, Some Additional Comments About Dimensional Analysis, Flow of multiphase mixtures, Properties of multiphase mixtures, The continuity equation for multiphase mixtures, The momentum equation for multiphase mixtures

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	Fluid mechanics is an important area of study in physics and engineering. There are several learning and teaching strategies that instructors can use to help facilitate student understanding of this complex topic. Here are a few: Hands-on experience: One of the best ways to learn about fluid mechanics is through hands-on experiences. Students can conduct experiments, work on projects, and participate in simulations that allow them to directly see the principles of fluid mechanics in action. Visual aids: Another effective teaching strategy is the use of visual aids such as animations, diagrams, and videos. These can help to illustrate complex concepts in a more easily understandable way. Active learning: Active learning strategies, such as group work and problem-based learning, can help students to better understand fluid mechanics by encouraging them to interact with the material and each other. Real-world examples: Using real-world examples can be a very effective teaching strategy in fluid mechanics. Students can better understand how these principles are applied in real life and this can help to increase their engagement and understanding. Concept mapping: Concept mapping is a teaching strategy where students create visual representations of their understanding of a particular topic. This can be particularly effective in fluid mechanics as it can help students to better understand the relationships between different concepts

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem)	47	**Unstructured SWL (h/w)**	3

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduce the principles of viscous flow in pipes.
Week 2	Define Reynolds Number to know the laminar and turbulent flow
Week 3	The Entrance Region, Entry Lengths Laminar Flow in Pipes,
Week 4	Pressure Drop and Head Loss, Effect of Gravity on Velocity and Flow Rate in Laminar Flow
Week 5	Laminar Flow in Noncircular Pipes, Turbulent Flow, The Moody Chart,
Week 6	Major Losses, Minor Losses
Week 7	Mid-term Exam

Week 8	Dimensional Analysis
Week 9	The Rayleigh Method,
Week 10	Buckingham Pi Theorem
Week 11	Determination of Pi Terms Some Additional Comments About Dimensional Analysis
Week 12	Flow of multiphase mixtures
Week 13	Properties of multiphase mixtures
Week 14	The continuity equation for multiphase mixtures
Week 15	The momentum equation for multiphase mixtures
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Fluid properties
Week 2	Lab 2: Dead weight calibrated
Week 3	Lab 3: Manometers
Week 4	Lab 4: Visualization of the flow in the channels
Week 5	Lab 5: Pitot static tube
Week 6	Lab 6: Bernoulli´s Theorem Demonstration
Week 7	Lab 7: Reynolds number

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Fluid Mechanics by Munson	Online
Recommended Texts		Online
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

<table>
<tr><th colspan="4">Module Information</th></tr>
<tr><td>Module Title</td><td colspan="2">Petroleum reservoir engineering I</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Core</td><td rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☐ Tutorial
☒ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">PE 311</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">150</td></tr>
<tr><td>Module Level</td><td></td><td>Semester of Delivery</td><td></td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td></td></tr>
<tr><td>Module Leader</td><td>Hamzah Salih Mahdi</td><td>e-mail</td><td></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>External lecturer</td><td>Module Leader’s Qualification</td><td>M.S.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td>1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim is to provide students with a comprehensive understanding of the properties and behavior of reservoir rocks. This includes studying rock properties such as porosity, permeability, saturation, wettability, capillary pressure, and relative permeability. By gaining a deep understanding of these properties, students will be able to analyze and predict the behavior of fluids within the reservoir, which is essential for making informed decisions about the extraction of oil and gas.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Overall, the course's learning outcomes equip students with the necessary knowledge, skills, and tools to analyze, characterize, and optimize reservoir performance based on rock properties. They will be well-prepared to tackle real-world reservoir engineering challenges and contribute to the efficient and sustainable extraction of hydrocarbon resources.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students’ participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to reservoir engineering. • Introduction about reservoir rocks and reservoir fluids. • Introduction core analysis and how to obtain representative core material.

Week 2	Porosity • Types and classification of porosity • Parameters that influence porosity • Laboratory measurement of porosity • Averaging of Porosity
Week 3	Absolute Permeability • Darcy's Law • Heterogeneity, An Isotropy, And Permeability Tensor • Averaging Of Permeabilities
Week 4	Absolute Permeability • Laboratory Measurement of Absolute Permeability • Factors Affecting Absolute Permeability
Week 5	Fluid Saturation • Distribution of fluid saturation in a petroleum reservoir • Reservoir Rock Samples Used for Fluid Saturation Determination. • Assessing the validity of fluid saturation data measured on the plug-end trim for the core plug sample.
Week 6	Fluid Saturation • Special types of fluid saturations. • Saturation averaging. • Factors affecting fluid saturation determination. • Skin factor derivation.
Week 7	Wettability • Introduction • Interfacial and surface tension. • Wettability • Fundamental concepts of wettability • Discussion on practical aspects of wettability
Week 8	Wettability • measurement of reservoir rock wettability • Factors affecting wettability. • Relationship between wettability and irreducible water saturation and residual oil saturation

	• Quiz about absolute Saturation
Week 9	Capillary pressure • Introduction • Excess Pressure Inside Curved Surface • The basic mathematical expression of capillary pressure • The rise of liquid in capillaries and the plateau equation • Quiz about wettability
Week 10	Capillary pressure • Dependence of capillary pressure on rock and fluid properties • Capillary pressure and saturation history • Laboratory measurement of capillary pressure. • Converting laboratory capillary pressure data to reservoir conditions • Characteristics of capillary pressure curves
Week 11	Capillary pressure • Averaging capillary pressure: j function • Effect of wettability on capillary pressure • Practical application of capillary pressure • Zonation, fluid contacts, and initial saturation distribution in a reservoir
Week 12	Relative permeability. • Factors Affecting Relative Permeability • Steady-State Technique measurements • Quiz about Capillary pressure
Week 13	Relative permeability • Unsteady-State Technique
Week 14	Relative permeability • Capillary End Effect • Determination of relative permeability from capillary pressure data • Factors Affecting Relative Permeability Measurements • Peculiarities of relative permeability data • Assessing the validity of relative permeability data and determination of Corey exponents • Significance of Relative Permeability Data • Three Phase Relative Permeabilities
Week 15	Final Submission of problems and exercises

	• Solving the problems and the exercises using one of the following MATLAB, Mathcad, or Excel
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Helium porosimeter
Week 2	Lab 2: Vacuum Saturation
Week 3	Lab 3: Permeability measurement using Gas.
Week 4	Lab 4: Retort Distillation and Dean-Stark Extraction
Week 5	Lab 5: Mercury Injection Method and Centrifuge Method
Week 6	Lab 6: CONTACT ANGLE MEASUREMENT and Amott Test or USBM Method
Week 7	Lab 7: relative permeability steady state technique and unsteady state technique

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Abhijit Y. Dandekar 2013 "Petroleum Reservoir Rock and Fluid Properties" Tarik Ahmed 2019 "Reservoir Engineering Handbook, 5th edition" Tom Blasingame lectures and lecture note	Yes
Recommended Texts	Professor Tom Blasingame Lectures and contributions (Directory Listing (tamu.edu)) Advanced Mathematics for Engineers and Scientists, M.R. Spiegel, Schaum's Series (1971). [The 1st edition, the 1971	No

	text.]	
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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MODULE DESCRIPTION FORM

<table>
<tr><th colspan="4">Module Information</th></tr>
<tr><td>Module Title</td><td colspan="2">Drilling Engineering and Well Design</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Core</td><td rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">PE 312</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">150</td></tr>
<tr><td>Module Level</td><td>3</td><td>Semester of Delivery</td><td>1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td>Type College Code</td></tr>
<tr><td>Module Leader</td><td>Ahmed K. Abbas</td><td>e-mail</td><td></td></tr>
<tr><td>Module Leader's Acad. Title</td><td></td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td>1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>Drilling Engineering</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	The Drilling Engineering Module is designed to provide students with an in-depth understanding of the principles and techniques involved in drilling oil wells. The module covers various aspects of drilling wells, including drilling fluids, including mixing and analysis of rheological properties; drilling hydraulics, drill bit selection, casing design; well cementing; pore pressure and geomechanical considerations in drilling; introduction to directional drilling and deviated wells.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The purpose of the course is to learn the how to conduct fundamental tasks in well design and drilling operations. The lab specifically deals with the preparation, analysis and properties of fluids used in the drilling of oil and gas wells. Specific course objectives are: 1. Learn the basic components used in drilling and the rig system. 2. Develop casing program, design casing based on pore pressure and fracture gradient and cementing program and understand requirements to protect fresh water. Select casing strings based on burst, collapse, tension. 3. Understand basic methods to select, rig size, BOP ratings, drilling bit, bottom hole assemblies. 4. Maintain well control by calculating mud weight necessary to maintain well control and understand how mud additives can be used to prevent kick and improve hole cleaning. 5. Be introduced to technologies and tools for directional drilling. 6. Know basic fishing tool types and applications. In addition, the lab are to instruct students on: (1) the primary functions of oilfield drilling fluids; (2) the procedures to measure drilling fluids and cement properties; (3) the common additives used to obtain the desirable properties under various well conditions; (4) the main factors controlling mud selection; and (5) training students on report writing skills.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
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Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Overview of the Drilling Process, Rigs and Rig systems.
Week 2	Wellbore Elements and Volumes
Week 3	Hydrostatic pressures in the wellbore and subsurface - Quiz
Week 4	Drilling Fluids, I
Week 5	Drilling Fluids, II Quiz
Week 6	Safe Mudweight window - Pore Pressure
Week 7	Safe Mudweight window - Fracture gradients Quiz
Week 8	Casing design, I
Week 9	Casing design, II Quiz
Week 10	Cements
Week 11	Cementing Procedures Quiz
Week 12	Casing design, collapse, burst, tensile, I
Week 13	Casing design, II Quiz
Week 14	Roller Cone and Drag drilling bits

Week 15	PDC drilling bits Quiz
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Well schematics with I-Handbook™, Lab safety
Week 2	Lab 2: Basic drilling fluid properties
Week 3	Lab 3: Sand content
Week 4	Lab 4: Fluid Loss A
Week 5	Lab 5: Fluid Loss B
Week 6	Lab 6: Weighted mud
Week 7	Lab 7: Rig systems

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Applied Drilling Engineering, Textbook Vol. 2 Authors: A.T. Bourgoyne Jr., K.K. Millheim, M.E. Chenevert	Yes
Recommended Texts	Fundamentals of Drilling Engineering. SPE Textbook Series, Vol 12, Authors: R.F. Mitchell and S.Z Miska	yes
Websites		

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
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MODULE DESCRIPTION FORM

<table>
<tr><th colspan="6">Module Information</th></tr>
<tr><td>Module Title</td><td colspan="2">Production engineering 1</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Core</td><td colspan="3" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">PE 313</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">125</td></tr>
<tr><td>Module Level</td><td>3</td><td colspan="2">Semester of Delivery</td><td colspan="2">1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Mohammed Abdul Ameer</td><td>e-mail</td><td colspan="3">Dr.alhumairi@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>Production engineering and reservoir engineering</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim of the production engineering module in the third grade of the petroleum engineering department is to provide students with a comprehensive understanding of the principles and practices involved in the production of oil and gas. The module focuses on developing students' knowledge and skills related to the design, optimization, and management of oil and gas production systems. Well Completion and Stimulation: Students will gain knowledge of well completion techniques and stimulation methods. This includes understanding different types of well completions, hydraulic fracturing, and acidizing. Field Development Planning: Students will gain an understanding of field development planning processes. They will learn how to evaluate reservoir potential, estimate recoverable reserves, and design production strategies for optimal field development.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Understand the fundamental principles of production engineering: Students should be able to demonstrate a comprehensive understanding of the basic principles and concepts of production engineering, including reservoir characteristics, fluid flow, well completion, and artificial lift methods. Analyze and interpret production data: Students should be able to collect and analyze production data from oil and gas wells, interpret the results, and identify potential production issues or opportunities for optimization. Design well completions: Students should be able to design and optimize well completions, considering factors such as reservoir characteristics, wellbore stability, and production objectives. They should also be able to evaluate different completion techniques and select the most appropriate ones for specific reservoir conditions. Evaluate and select artificial lift methods: Students should be able to assess different artificial lift methods, including gas lift, sucker rod pumps, electric submersible pumps (ESPs), and hydraulic pumps. They should be able to analyze well performance and reservoir characteristics to select the most suitable artificial lift method for maximizing production. Identify and troubleshoot production problems: Students should be able to identify common production problems, such as scaling, sand production, and wax deposition, and propose effective solutions to mitigate or eliminate these issues. They should also be familiar with troubleshooting techniques to address equipment failures or operational challenges.

	Understand production optimization techniques: Students should be aware of various production optimization techniques, such as well stimulation, hydraulic fracturing, and workover operations. They should be able to evaluate the potential benefits and limitations of these techniques and apply them to enhance production rates and ultimate recovery. Apply health, safety, and environmental practices: Students should demonstrate a strong commitment to health, safety, and environmental practices in the production engineering field. They should be aware of relevant regulations and industry standards and incorporate them into their decision-making process to ensure safe and environmentally responsible operations. Communicate effectively: Students should be able to communicate technical concepts, analysis results, and recommendations effectively, both orally and in written form. They should be able to present their findings and ideas to both technical and non-technical audiences, demonstrating clarity, coherence, and professionalism.
Indicative Contents المحتويات الإرشادية	Introduction to Production Engineering: Overview of production engineering in the petroleum industry, its importance, and its role in maximizing hydrocarbon recovery. Reservoir Fluid Properties: Understanding the behavior of reservoir fluids, including oil, gas, and water, their physical properties, phase behavior, and their impact on production. Well Performance: Analyzing the performance of oil and gas wells, studying inflow and outflow performance relationships, wellbore flow, and pressure behavior. Well Completion: Techniques and technologies for completing and optimizing oil and gas wells, including completion design, perforation strategies, and well stimulation. Artificial Lift Systems: Introduction to artificial lift methods, such as rod pumping, gas lift, and electric submersible pumps (ESP), and their application in enhancing production from oil and gas wells. Wellbore Hydraulics: Understanding the fluid flow behavior in wellbores, pressure drop calculations, and optimization of production rates through proper design and selection of tubing and flow control equipment. Production Facilities: Introduction to surface production facilities, including separators, storage tanks, pumps, compressors, and pipelines, and their role

	in the processing and transportation of hydrocarbons. Production Optimization: Techniques for optimizing production rates and enhancing hydrocarbon recovery, such as nodal analysis, artificial lift optimization, water and gas injection strategies, and reservoir management. Well Surveillance and Production Monitoring: Methods for monitoring well performance, data acquisition, analysis, and interpretation, and the use of surveillance tools to diagnose and troubleshoot production issues. Production Forecasting: Introduction to production forecasting techniques, decline curve analysis, material balance, and numerical simulation for predicting future production rates and reservoir behavior.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Type of well – total production system and its component
Week 2	Types of completion single, dual, triple zones(advantage and disadvantage of each of the completion)
Week 3	Gathering line on the surface, and Types of storage tanks, requirement and definition.
Week 4	Separator definition, Separator types and classification, Separator and the separation mechanism, the effect on separation mechanism
Week 5	Separator sizing and calculation of each phase area.
Week 6	Conning definition and different methods to calculate the critical flow
Week 7	Choke performance, type of chokes, importance of choke for production practice.
Week 8	Different methods to calculate the choke performance(Gilbert and Ros).
Week 9	Introduction to well stimulation, types of well stimulation.
Week 10	Hydraulic fracture and its calculation (dimension of hydraulic fracture)

Week 11	Drill Stem Test: introduction to well test, requirement to well test.
Week 12	Calculation of permeability (k), skin factor(S), initial pressure(Pi) and pressure drop due to skin.
Week 13	Practice to calculate different parameters from DST
Week 14	Final Project and Exam Preparation Completion of a well test project
Week 15	Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws
Week 3	Lab 3: First-Order Transient Responses
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: Frequency Response of RC Circuits
Week 6	Lab 6: Frequency Response of RLC Circuits
Week 7	Lab 7: Filters

Learning and Teaching Resources

	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach	No

	Copyright Year: 2020, dissidents.	
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information				
Module Title	**Well Logging**		**Module Delivery**	
Module Type	**Annual**		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☒ Seminar	
Module Code	**PE 314**			
ECTS Credits	**5**			
SWL (hr/sem)	**125**			
Module Level	UGx11 3		**Semester of Delivery**	1
Administering Department	Petroleum Engineering		**College**	Engineering college
Module Leader			**e-mail**	
Module Leader's Acad. Title	Lect.		**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail
Peer Reviewer Name	Name		**e-mail**	E-mail
Scientific Committee Approval Date	17/06/2023		**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of well logging through the application of techniques. 2. gives insights into the role of borehole measurements in the search for and evaluation of hydrocarbon reservoirs 3. The module covers a number of measurement methods, and how these are used to determine important rock parameters such as porosity, permeability,

	water saturation and the rock types along the borehole. 4. This module deals with the fundamental petrophysical concepts and equations. How does the composition of the rock influence the measurements we do and important petrophysical parameters like porosity, permeability and saturation. 5. This is the most important log measurements used in boreholes: Resistivity, natural gamma radiation, neutron porosity, density, photoelectric absorption, acoustic measurements, formation pressures, nuclear magnetic resonance and more. 6. The measurement environment in a borehole and environmental corrections of the data. 7. Find how the measured properties can be used to determine the porosity, permeability, water/hydrocarbon saturation, shale content and rock type. 8.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Know the logging operations and data acquisition for logging while drilling and open hole logging. 2- Know the physics of various logging tools. 3- Describe different rock properties such as porosity, permeability and saturation based on basic definition. 4- Interpret individual and combination of wire-line log data for lithology and fluids 5- Interpret different wire-line log data by cross-plotting 6- Estimate hydrocarbon volume in the reservoir based on reservoir properties 7- Know the main applications and limitations of the different measurements 8- Perform a quick qualitative interpretation to determine possible interest zones 9- The students are expected to understand and to make simple interpretations of the more common log measurements that are made in a borehole. They should be able to determine the main lithologies and estimates of porosity, saturation and permeability, and which fluid types, water, oil or gas, are present in the formations. 10- As a General competence: During group work the students learn to cooperate and to take responsibility for their part of the assignments given. By working with real data from the field, they learn to understand that real data can be uncertain and that one has to use common sense and understanding in order to find good answers to the interpretation problems.
Indicative Contents المحتويات الإرشادية	This course is a "must have" for anyone working with the subsurface within the petroleum industry. Well logging provides data to answer fundamental questions regarding petrophysical, geological and mechanical properties required to evaluate, develop and produce a field. The course covers The fundamental rock properties and petrophysical concepts and equations. The following well logging measurements are discussed: SP log, gamma ray log, Caliper log, conventional resistivity log, induction log; lateral log, macro resistivity log, acoustic/sonic log, density log, photoelectric absorption, neutron porosity, nuclear magnetic resonance, TDT log, CBL log and quick method in

	(HC) detection. Further topics include the measurement environment, geometrical considerations in a borehole, environmental corrections, and the link between the measured parameters and the rock's porosity, permeability, fluid/gas saturation, lithology and clay content. Through exercises and projects the students will learn how to interpret well log data. During group work the students learn to cooperate and to take responsibility for their part of the assignments given. By working with real data from the field, they learn to understand that real data can be uncertain and that one has to use common sense and understanding in order to find good answers to the interpretation problems.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching/Learning Strategies include: 1- Direct Instruction in classroom, 4 hrs per week. 2- Classroom Discussions 3- Group Design Projects 4- Seminars Methods of assessment for students. 1- Compulsory exercises 2- Quarterly exams. 3- Discussions and assignments for project. *The overall assessment for this course is as follows: Annual pursuit of 30 points from the total mark, which includes assignments, oral examinations and quarterly in addition to presentations. *70 marks for the final exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

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
	Projects / Lab.	None	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction
Week 2,3	Basic rock properties, petrophysics
Week 4	Sp log
Week 5	GR log
Week 6	Caliper log
Week 7,8, 9	conventional resistivity log, induction log; lateral log, macro resistivity log
Week10,11,12	Porosity log: sonic log, density log, neutron log
Week 13	nuclear magnetic resonance
Week 14,15	CBL log
Week 16,17, 18	Porosity applications for lithology and mineralogy indications
Week 19	Porosity determination in “clean” formations –for liquid and lithology
Week20, 21, 22	Improved mineralogy Identification with cross plots
Week 23,24,25	Shaly formation interpretation, and Shaly sand saturation versus Archie equation
Week 26, 27	Well log analysis - Overview of permeability and calculations for sedimentary rocks
Week28,29,30	Quick-Look methods for determining the presence of hydrocarbons

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	"Theory, Measurement, and Interpretation of Well Logs " Bassiouni , McGraw-Hill Education	Yes
Recommended Texts	1-Basic well log analysis 2- Open Hole Wireline Logging 3- Wireline Logging operations	Yes
Websites	None	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>**Module Title**</td><td colspan="3">**Engineering Analysis I**</td><td colspan="2">**Module Delivery**</td></tr>
<tr><td>**Module Type**</td><td colspan="3">**Core**</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>**Module Code**</td><td colspan="3">**PE 315**</td></tr>
<tr><td>**ECTS Credits**</td><td colspan="3">**4**</td></tr>
<tr><td>**SWL (hr/sem)**</td><td colspan="3">**100**</td></tr>
<tr><td colspan="2">**Module Level**</td><td>UGx11 3</td><td colspan="2">**Semester of Delivery**</td><td>1</td></tr>
<tr><td colspan="2">**Administering Department**</td><td>PENG</td><td>**College**</td><td colspan="2">CENG</td></tr>
<tr><td>**Module Leader**</td><td colspan="2"></td><td>**e-mail**</td><td colspan="2"></td></tr>
<tr><td colspan="2">**Module Leader’s Acad. Title**</td><td>Assistant Professor</td><td colspan="2">**Module Leader’s Qualification**</td><td>Ph.D.</td></tr>
<tr><td>**Module Tutor**</td><td colspan="2">Name (if available)</td><td>**e-mail**</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">**Peer Reviewer Name**</td><td>Name</td><td>**e-mail**</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">**Scientific Committee Approval Date**</td><td>17/06/2023</td><td>**Version Number**</td><td colspan="2">1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>**Prerequisite module**</td><td>CENG213 (Mathematics III) & CENG224 (Mathematics IV)</td><td>**Semester**</td><td>Third and Fourth</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This module is intended to expose the students to understand the basic ideas of differential equations (DE) combined with its definition, types, orders, and degrees. It provides a comprehensive understanding of solving differential equations with 1^{st} order and nth order using different approaches. This module is a fundamental module that provides students with the mathematical skills and knowledge necessary for solving engineering problems in the petroleum industry. It covers a range of mathematical concepts and techniques applicable to various engineering disciplines, including petroleum engineering. Engineering Analysis Module (I) provides students with a solid foundation in mathematical principles and problem-solving techniques necessary for understanding and analyzing complex engineering problems in petroleum engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of this module, students will be able to: 1- Understand the fundamentals of differential equations. 2- Classify the differential equations based on its type, order, and degree. This will help to identify the best method for solving the differential equations. 3- Solve the 1^{st} order of DE using different methods including separable, exact, homogenous, linear, Bernoulli, and Ricatti's methods. 4- Apply of 1^{st} DE for solving different physical problems including Cooling Problems, Falling Bodies, Growth and Decay, and Dilution Problems. 5- Solve the nth order of LDE with constant coefficients using two methods: Undetermined Coefficients and Variation of Parameters. Then, applying that on Spring-Mass System. 6- Solve the 2^{nd} DE with variable coefficient using different methods such as Power-series method, Tayler, Frobenius, and Bessel's function methods.
Indicative Contents المحتويات الإرشادية	The Module of Engineering Analysis I is an important course to understand the fundamentals of differential of differential equations and how it can be solved. It covers various aspects and applications of differential equations. It can help students to learn how to translate the physical problems into differential equations which can be then solved based on the initial and boundary conditions of this DE. This model will also deeply help the students to understand the numerical methods which can be used for simulating the reservoir

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the discussion in class and quick quizzes. This will be

	achieved through classes, interactive tutorials and by considering a simple type of strategy involving some examples related to petroleum industry that have been solved and understood using differential equations. * Lectures are conducted by face-to-face education in the classroom, two hours per week, and students' technical reports. * Conducting dialogues and discussions with the request. **Methods of assessment for students.** * Quarterly exams. * Discussions and assignments. *The overall assessment for this course is as follows: Annual pursuit of 30 points from the total mark, which includes quizzes, assignments in addition to presentation. *70 marks for the final exam

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Exams	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	5% (5)	2 and 12	LO #3, #4 and #6, #7
	Presentation	1	5% (5)	13	All
	Report	None	None	None	--------
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 and LO #7
	Final Exam	3hr	70% (70)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Ordinary Differential Equations: Review of Fundamental Concepts
Week 2, 3	1^{ST} Order Linear Differential Equations: Types and Solutions
Week 4,5	Application of 1^{st} Order Linear Differential Equations
Week 6,7	Solution of nth order of LDE using Undetermined Coefficients
Week 8	Solution of Nth order of LDE using Variation of Parameters
Week 9	Solution of Linear Differential Equations with Variable Coefficients/ Cauchy-Euler Method
Week 10,11	Solution of 2^{nd} Order DE with variable coefficients using Power-Series Method
Week 12	Solution of 2^{nd} Order DE with variable coefficients using Tayler-Series Method
Week 13, 14	Solution of 2^{nd} Order DE with variable coefficients using Frobenius Method/ Three Cases

Week 15	Preparation and Help Session for the Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Curriculum and textbook	Yes
Recommended Texts	• Engineering Mathematics", by John Bird, 5th edition, Elsevier Ltd., 2007 • Advanced Engineering Mathematics", by Peter V. O'Neil, 7th Edition, Cengage Learning, 2012	Yes
Websites	None	

Grading Scheme				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
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	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

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MODULE DESCRIPTION FORM

Module Information					
Module Title	Petroleum Eng. Economics			**Module Delivery**	
Module Type	Core			☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	PE 316				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	3		**Semester of Delivery**	1	
Administering Department	Type Dept. PE		**College**	E	
Module Leader	Ryadh Tuma		**e-mail**	ryadtuma@uomisan.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/10/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Production engineering & reservoirs Eng	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims أهداف المادة الدراسية	basic petroleum and Gas concepts & Oil Economic concepts and conversion standards and transactions - its composition Oil formation theories Types of oil The economic functions of oil.

	To achieve the required understanding by students of economic concepts associated with the oil industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	A This material of study will be increasing the level of knowledge and skills to evaluate the required aspects of economics as part of petroleum and gas industries. The study of analysis the economics tools will helps determine level of investments and risks related with oil-fields. Accuracy and integration of information with practical reality will be one of the most important outputs that reflect the current and future economic outlook in the oil industry or the optimal use of this industry in other supporting industries. Accuracy in presenting examples and the standard of economic analysis and evaluation will be a major part of this study stage.
Indicative Contents المحتويات الإرشادية	NA

Learning and Teaching Strategies	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. Using pdf and ppt format during the course of study will be main tools within different level of exercises and solved problem.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Overview petroleum and gas Functions of petroleum economics. Importance of petroleum Economics & Characteristics of the oil industry
Week 2	Economic aspects for Oil and gas reserve. organization of petroleum exporting and importing countries
Week 3	International supply and demand of petroleum. classification of petroleum,
Week 4	petroleum pricing, alternative energy, international strategy of energy, Alternative energy, international strategy of energy,
Week 5	Time value of money , Quiz

Week 6	Types of interest rates , Mid Exam
Week 7	Investments Evaluations, NET PRESENT VALUE, NPV, IRR, MIRR etc. & Hurdle and minimum acceptable rates of return profitability Index
Week 8	NPV, IRR, MIRR etc. & Hurdle and minimum acceptable rates of return profitability Index, Distinguishing cash flow from income and profit
Week 9	Sources of revenue and cost & lifecycle costing, Cost classifications & relationship between costs and revenue
Week 10	Break Even Analysis, risk analysis production decline curves,
Week 11	Decision models, game theory, Risk adjustments when valuing petroleum reserve Categories, Sensitivity analysis of engineering projects.
Week 12	Sensitivity analysis of engineering projects, Applications of Sensitivity analysis of engineering projects, Quiz
Week 13	methods of engineering decisions, depreciation methods, depreciation methods
Week 14	taxation, inflation, Bidding process and re-awarded contracts and Future production of oil and gas wells, Bidding process and re-awarded contracts and Future production of oil and gas wells
Week 15	Paybacks methods
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Fundamentals of economic concepts in oil and gas	Yes
Recommended Texts		No
Websites	https://www.coursera.org/browse/Economic_petrlomue	

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 – 100	Outstanding Performance
	B - Very Good	جيد جدا	80 – 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

<table>
<tr><th colspan="4">Module Information</th></tr>
<tr><td>Module Title</td><td colspan="2">Petroleum reservoir engineering I I</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Core</td><td rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☐ Tutorial
☒ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">PE 321</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">3</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">150</td></tr>
<tr><td>Module Level</td><td></td><td>Semester of Delivery</td><td></td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td></td></tr>
<tr><td>Module Leader</td><td>Hamzah Salih Mahdi</td><td>e-mail</td><td></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>External lecturer</td><td>Module Leader’s Qualification</td><td>M.S.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td>1.0</td></tr>
</table>

<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td></td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents

Module Aims أهداف المادة الدراسية	The aim of the reservoir engineering course is to provide students with a comprehensive understanding of key concepts in petroleum reservoir engineering. This course focuses on fluid properties, phase behavior, PVT (Pressure-Volume-Temperature) sampling, compositional analysis of reservoir fluids, PVT analysis, and properties of formation waters. By the end of the course, students will have a solid foundation in these areas, enabling them to accurately characterize reservoirs, predict fluid behavior, and make informed decisions for efficient reservoir management.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	students should have a comprehensive understanding of the behavior and characteristics of fluids in petroleum reservoirs. They should be able to apply this knowledge to analyze and interpret PVT data, conduct compositional analysis of reservoir fluids, and make predictions about reservoir performance. Additionally, students should understand the principles of vapor-liquid equilibria and their application in reservoir engineering, as well as the impact of formation waters on reservoir performance. This knowledge will equip them with the skills necessary to make informed decisions about the development and management of oil and gas fields.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Petroleum Reservoir Fluids • Introduction • Chemistry of petroleum • Solid components of petroleum • Classification of reservoir gases and oils

	• Five reservoir fluids • Other hydrocarbon fluids of interest • Formation waters
Week 2	Introduction to Phase Behavior • Introduction • Definition of terms used in phase behavior. • Phase behavior of a pure component • Phase behavior of two-component • Phase behavior of multicomponent mixtures • Construction of phase envelopes
Week 3	Phase Behavior of Petroleum Reservoir Fluids • Introduction • Preamble to the phase behavior of petroleum reservoir fluids • Brief description of the plus fraction • Classification and identification of fluid type • Black oils • Volatile oils • Gas condensates • Wet gases • Dry gases • Behavior of petroleum reservoir fluids in the two-phase region • Saturated hydrocarbon reservoirs • Production trends of five reservoir fluids
Week 4	PVT sampling • Introduction • Practical considerations of fluid sampling • Methods of fluid sampling • Evaluating the representativity of fluid samples: quality checks • Factors affecting sample representativity
Week 5	Compositional Analysis of Petroleum Reservoir Fluids • Introduction • Strategy of compositional analysis • Characteristics of reservoir fluid composition • Gas chromatography • True boiling-point distillation • Characterization of pseudo fractions and residue

Week 6	PVT Analysis and Reservoir Fluid Properties • Introduction • Properties of gases and liquid • Properties of Ideal gas • Properties of real gas • Properties of mixture of gases
Week 7	PVT Analysis and Reservoir Fluid Properties • Properties of black oil and volatile oil
Week 8	PVT Analysis and Reservoir Fluid Properties • PVT Laboratory tests • PVT Equipment • Constant Composition Expansion • Differential Liberation • Constant Volume Depletion • Separator Tests
Week 9	PVT Analysis and Reservoir Fluid Properties • Adjustment of Black Oil Laboratory Data • Other sources of obtaining the properties of petroleum reservoir fluids
Week 10	Vapor–Liquid Equilibria • INTRODUCTION • IDEAL MIXTURES • EMPIRICAL CORRELATIONS FOR CALCULATING EQUILIBRIUM RATIOS FOR REAL SOLUTIONS
Week 11	Vapor–Liquid Equilibria • IEQUATIONS-OF-STATE (EOS) MODELS • Use of EOS Models in PVT Packages
Week 12	Properties of Formation of Waters • Compositional characteristics of formation waters • Bubble-point pressure of formation water • Formation volume factor of formation water • Density of formation water • Viscosity of formation water • Solubility of hydrocarbons in formation water • Solubility of formation water in hydrocarbons

	• Compressibility of formation water
Week 13	Material balance • Introduction to Material balance equation and its most common features
Week 14	The continuity equation • Introduction to the derivation of the continuity equation and its uses for the two common coordinate system which are the cylindrical and the rectangular • The Linearization of the equation and the analytical solution and the uses of it in PTA and RTA • Introduction to the numerical solution of the continuity equation through the implementation of finite difference methods.
Week 15	Final Submission of problems and exercises • Solving the problems and the exercises using one of the following MATLAB, Mathcad, or Excel
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Construction of Phase Envelopes
Week 2	Lab 2: Gas Chromatography
Week 3	Lab 3: True Boiling-Point Distillation
Week 4	Lab 4: Constant Composition Expansion
Week 5	Lab 5: Differential Liberation
Week 6	Lab 6: Constant Volume Depletion
Week 7	Lab 7: Separator Tests

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Abhijit Y. Dandekar 2013 “Petroleum Reservoir Rock and Fluid Properties” Tarik Ahmed 2019 “Reservoir Engineering Handbook, 5th edition” Tom Blasingame lectures and lecture note	Yes
Recommended Texts	Professor Tom Blasingame Lectures and contributions (Directory Listing (tamu.edu)) Advanced Mathematics for Engineers and Scientists, M.R. Spiegel, Schaum's Series (1971). [The 1st edition, the 1971 text.]	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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

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MODULE DESCRIPTION FORM

<table>
<tr><th colspan="4">Module Information</th></tr>
<tr><td>Module Title</td><td>Drilling Engineering and Well Design</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td>Core</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td>PE 322</td></tr>
<tr><td>ECTS Credits</td><td>6</td></tr>
<tr><td>SWL (hr/sem)</td><td>150</td></tr>
<tr><td>Module Level</td><td>3</td><td>Semester of Delivery</td><td>2</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td>Type College Code</td></tr>
<tr><td>Module Leader</td><td>Ahmed K. Abbas</td><td>e-mail</td><td></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td></td><td>Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
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</table>

<table>
<tr><th colspan="4">Relation with other Modules

العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>Drilling Engineering</td><td>Semester</td><td></td></tr>
</table>

Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Drilling Engineering Module is designed to provide students with an in-depth understanding of the principles and techniques involved in drilling oil wells. The module covers various aspects of drilling wells, including drilling fluids, including mixing and analysis of rheological properties; drilling hydraulics, drill bit selection, casing design; well cementing; pore pressure and geomechanical considerations in drilling; introduction to directional drilling and deviated wells.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The purpose of the course is to learn the how to conduct fundamental tasks in well design and drilling operations. The lab specifically deals with the preparation, analysis and properties of fluids used in the drilling of oil and gas wells. Specific course objectives are: 1. Learn the basic components used in drilling and the rig system. 2. Develop casing program, design casing based on pore pressure and fracture gradient and cementing program and understand requirements to protect fresh water. Select casing strings based on burst, collapse, tension. 3. Understand basic methods to select, rig size, BOP ratings, drilling bit, bottom hole assemblies. 4. Maintain well control by calculating mud weight necessary to maintain well control and understand how mud additives can be used to prevent kick and improve hole cleaning. 5. Be introduced to technologies and tools for directional drilling. 6. Know basic fishing tool types and applications. In addition, the lab are to instruct students on: (1) the primary functions of oilfield drilling fluids; (2) the procedures to measure drilling fluids and cement properties; (3) the common additives used to obtain the desirable properties under various well conditions; (4) the main factors controlling mud selection; and (5) training students on report writing skills.

Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7

	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Wellbore Stability & Drilling Problems, I
Week 2	Wellbore Stability & Drilling Problems, II Quiz
Week 3	Drilling Cost Analysis, II
Week 4	Drilling Cost Analysis, II Quiz
Week 5	Drill stem design, I
Week 6	Drill stem design, I
Week 7	Drill stem design, III Quiz
Week 8	Drilling Hydraulics
Week 9	Drilling Hydraulics - Pressure drop calculations Quiz
Week 10	Well Control – Kick, I
Week 11	Well Control – Kick, II Quiz

Week 12	Introduction to Directional Drilling, II
Week 13	Introduction to Directional Drilling, II Quiz
Week 14	Introduction to offshore drilling
Week 15	Well problems and Fishing tools and practices
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: Rig systems
Week 2	Lab 2: Drilling bits A
Week 3	Lab 3: Drilling bits B
Week 4	Lab 4: Kick
Week 5	Lab 5: Cement design
Week 6	Lab 6: Lab demonstration
Week 7	Lab 7: Well design

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Applied Drilling Engineering, Textbook Vol. 2 Authors: A.T. Bourgoyne Jr., K.K. Millheim, M.E. Chenevert	Yes
Recommended Texts	Fundamentals of Drilling Engineering. SPE Textbook Series, Vol 12, Authors: R.F. Mitchell and S.Z Miska	yes

Websites	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information معلومات المادة الدراسية		
Module Title	Production Engineering 2	**Module Delivery**
Module Type	**Core**	☒ **Theory** ☒ **Lecture**
Module Code	**PE 323**	
ECTS Credits	**5**	

SWL (hr/sem)	125		☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**		
Module Level	3		**Semester of Delivery**		2
Administering Department	Type Dept. PE		**College**	Type College Code	
Module Leader	Mohammed Abdul Ameer		**e-mail**	Dr.alhumairi@uomisan.edu.iq	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/10/2024		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	Production engineering and reservoir engineering	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The aim of the production engineering module in the third grade of the petroleum engineering department is to provide students with a comprehensive understanding of the principles and practices involved in the production of oil and gas. The module focuses on developing students' knowledge and skills related to the design, optimization, and management of oil and gas production systems. Stimulation: Students will gain knowledge of well stimulation methods. This includes understanding different types of well completions, hydraulic fracturing, and acidizing.

	Artificial Lift Systems: Students will be introduced to artificial lift methods used to enhance the production rate of oil and gas wells. They will learn about different types of artificial lift systems, including rod pumping, gas lift, and electrical submersible pumps. Throughout the module, students will also develop practical skills through hands-on exercises, case studies, and simulation exercises. The aim is to equip students with the necessary knowledge and skills to contribute effectively to the production operations in the petroleum industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Understand the fundamental principles of production engineering: Students should be able to demonstrate a comprehensive understanding of the basic principles and concepts of production engineering, including reservoir characteristics, fluid flow, well completion, and artificial lift methods. Analyze and interpret production data: Students should be able to collect and analyze production data from oil and gas wells, interpret the results, and identify potential production issues or opportunities for optimization. Design well completions: Students should be able to design and optimize well completions, considering factors such as reservoir characteristics, wellbore stability, and production objectives. They should also be able to evaluate different completion techniques and select the most appropriate ones for specific reservoir conditions. Evaluate and select artificial lift methods: Students should be able to assess different artificial lift methods, including gas lift, sucker rod pumps, electric submersible pumps (ESPs), and hydraulic pumps. They should be able to analyze well performance and reservoir characteristics to select the most suitable artificial lift method for maximizing production. Identify and troubleshoot production problems: Students should be able to identify common production problems, such as scaling, sand production, and wax deposition, and propose effective solutions to mitigate or eliminate these issues. They should also be familiar with troubleshooting techniques to address equipment failures or operational challenges. Understand production optimization techniques: Students should be aware of various production optimization techniques, such as well stimulation, hydraulic fracturing, and workover operations. They should be able to evaluate the potential benefits and

	limitations of these techniques and apply them to enhance production rates and ultimate recovery. Apply health, safety, and environmental practices: Students should demonstrate a strong commitment to health, safety, and environmental practices in the production engineering field. They should be aware of relevant regulations and industry standards and incorporate them into their decision-making process to ensure safe and environmentally responsible operations. Communicate effectively: Students should be able to communicate technical concepts, analysis results, and recommendations effectively, both orally and in written form. They should be able to present their findings and ideas to both technical and non-technical audiences, demonstrating clarity, coherence, and professionalism.
Indicative Contents المحتويات الإرشادية	Introduction to Production Engineering: Overview of production engineering in the petroleum industry, its importance, and its role in maximizing hydrocarbon recovery. Reservoir Fluid Properties: Understanding the behavior of reservoir fluids, including oil, gas, and water, their physical properties, phase behavior, and their impact on production. Well Performance: Analyzing the performance of oil and gas wells, studying inflow and outflow performance relationships, wellbore flow, and pressure behavior. Well Completion: Techniques and technologies for completing and optimizing oil and gas wells, including completion design, perforation strategies, and well stimulation. Artificial Lift Systems: Introduction to artificial lift methods, such as rod pumping, gas lift, and electric submersible pumps (ESP), and their application in enhancing production from oil and gas wells. Wellbore Hydraulics: Understanding the fluid flow behavior in wellbores, pressure drop calculations, and optimization of production rates through proper design and selection of tubing and flow control equipment. Production Facilities: Introduction to surface production facilities, including

	separators, storage tanks, pumps, compressors, and pipelines, and their role in the processing and transportation of hydrocarbons. Production Optimization: Techniques for optimizing production rates and enhancing hydrocarbon recovery, such as nodal analysis, artificial lift optimization, water and gas injection strategies, and reservoir management. Well Surveillance and Production Monitoring: Methods for monitoring well performance, data acquisition, analysis, and interpretation, and the use of surveillance tools to diagnose and troubleshoot production issues. Production Forecasting: Introduction to production forecasting techniques, decline curve analysis, material balance, and numerical simulation for predicting future production rates and reservoir behavior.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)**	4

الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
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	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Review of production engineering 1 and total production system.**
Week 2	**Inflow performance relationship (IPR): introduction, definition and explain the different cases**
Week 3	**Straight line IPR and the requirement to draw the IPR straight line**
Week 4	**Two phase IPR and the requirement to draw the IPR curve.**
Week 5	**Using Vogel's chart to construct IPR.**

Week 6	**Using standing chart to construct IPR.**
Week 7	**Application to use Vogel's, and standing charts to construct IPR.**
Week 8	**Construct combination IPR, by different methods.**
Week 9	**Vertical flow performance (VFP): introduction, definition and explain the different cases.** **Define the working chart, using working chart.**
Week 10	**Practice to use the working charts**
Week 11	**Artificial lift: methods, requirement for each method**
Week 12	**Gas lift, design and calculation.**
Week 13	**Electrical submersible pump, ESP, design and calculation.**
Week 14	**Final Project** **Completion of a production engineering 1 project.**
Week 15	**Exam preparation and review**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**

Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

<table>
<tr><th colspan="4">Module Information</th></tr>
<tr><td>Module Title</td><td>Geophysics</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td>Core</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td>PE 324</td></tr>
<tr><td>ECTS Credits</td><td>5</td></tr>
<tr><td>SWL (hr/sem)</td><td>125</td></tr>
<tr><td>Module Level</td><td>3</td><td>Semester of Delivery</td><td>2</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td>Type College Code</td></tr>
<tr><td>Module Leader</td><td>Zahraa R. Fakher</td><td>e-mail</td><td>geologist_2021@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Professor</td><td>Module Leader’s Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td>E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td>E-mail</td></tr>
</table>

Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Teaching the principle of geophysical exploration.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Learning the students, the main physical principles the used in petroleum exploration. And the equipment and techniques which developed for this purpose.
Indicative Contents المحتويات الإرشادية	Geophysical maps, Geo sections.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10

Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Define geophysics. What are the main physical properties of the rocks?
Week 2	The main physical laws used in geophysical exploration; Snell, Newton, and wave propagation.
Week 3	Gravity Method
Week 4	Application and Problems about gravity method.
Week 5	Analysis the gravity geophysical maps for petroleum traps.
Week 6	Magnetic Method.
Week 7	Application and examples of magnetic method.
Week 8	Examples of basement rock analysis by magnetic surveying.
Week 9	The main equipment and methods
Week 10	Refraction Methods
Week 11	Examples and problems about refraction interpretation
Week 12	Analysis the distribution of subsurface structures using refraction waves
Week 13	Reflection Method, the 2D, 3D and 4D seismic surveying
Week 14	Examples of reflection sections Interpretation
Week 15	Project Discussions
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	**Geophysics for Petroleum Engineers,** Fred Aminzadeh, Shivaji N. Dasgupta	No
Recommended Texts	On significant application of geophysical methods, Mansour Al Garni, 2018	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information					
Module Title	**Engineering Analysis II and Partial Differential Equations**			**Module Delivery**	
Module Type	**Core**			☒ Theory ☒ Lecture ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**PE 325**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	UGx11 3		**Semester of Delivery**	2	
Administering Department	PENG		**College**	CENG	
Module Leader			**e-mail**		
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	17/06/2023		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	CENG312 (Engineering Analysis I)	**Semester**	Fifth
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This module provides students with a solid foundation in mathematical principles and problem-solving techniques necessary for understanding and analyzing complex engineering problems in petroleum engineering. It is intended to expose the students to understand the basic ideas of differential equations (DE) combined with its solutions using Bessel's function, Gamma function, and Laplace Transforms. This module is also aimed to understand how to solve the differential equations using

	numerical methods. By understanding the fundamentals of numerical methods, the results of numerical methods in solving the DE can be compared with the analytical solution which represents the exact solution. Partial differential equations with its properties and how the initial value problems can be analyzed and solved will be covered in this module. This module is a fundamental module that provides students with the mathematical skills and knowledge necessary for solving engineering problems in the petroleum industry. It covers a range of mathematical concepts and techniques applicable to various engineering disciplines, including petroleum engineering. As overall as, scientists and engineers must know how to model the world in terms of differential equations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of this module, students will be able to: 7- Solve the 2^{nd} DE with variable coefficients using different functions and methods such as Bessel's function, and Gamma function. 8- Understand the importance of Laplace Transforms in solving the DEs. 9- Understand the definition of Laplace Transforms, transform of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms. Inverse Laplace Transforms will also be applied to reach the solution of differential equations. 10- Understand the basic functioning of numerical methods including Basic and Modified Euler methods and compare that with the analytical exact solution. 11- Understand the basic of partial differential equations and how it can be used to solve the initial-value problems.
Indicative Contents المحتويات الإرشادية	The Module of Engineering Analysis II is Solve the 2^{nd} DE with variable coefficients using different functions and methods such as Bessel's function, and Gamma function. Understand the importance of Laplace Transforms in solving the DEs. Understand the definition of Laplace Transforms, transform of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms. Inverse Laplace Transforms will also be applied to reach the solution of differential equations. Understand the basic functioning of numerical methods including Basic and Modified Euler methods and compare that with the analytical exact solution. Understand the basic of partial differential equations and how it can be used to solve the initial-value problems.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the discussion in class and quick quizzes. This will be achieved through classes, interactive tutorials and by considering a simple type of strategy involving some of examples related to petroleum industry that have been solved and understood using differential equations.

	* Lectures are conducted by face-to-face education in the classroom, two hours per week, and students' technical reports. * Conducting dialogues and discussions with the request. **Methods of assessment for students.** * Quarterly exams. * Discussions and assignments. *The overall assessment for this course is as follows: Annual pursuit of 30 points from the total mark, which includes quizzes, assignments in addition to presentation. *70 marks for the final exam

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية				
	Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**

Formative assessment	Exams	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	5% (5)	2 and 12	LO #3, #4 and #6, #7
	Presentation	1	5% (5)	13	All
	Report	None	None	None	--------
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 and LO #7
	Final Exam	3hr	70% (70)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Ordinary Differential Equations and Partial Differential Equations.
Week 2	Introduction to the Laplace Transforms
Week 2, 3	Understanding the transformation of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms.
Week 4,5	Learn students how to apply the Inverse Laplace Transforms characteristics by which the differential equation can be solved.
Week 6,7	Understand the definition of Laplace Transforms, transform of Elementary functions such as Trigonometric, Exponential, and Polynomial functions, as well as properties of Laplace Transforms. Inverse Laplace Transforms will also be applied to reach the solution of differential equations.
Week 8,9	Applications of numerical methods to solve the differential equations and perform a comparison between the numerical methods and exact solutions.
Week 9	Fourier Series
Week 10,11	Fourier Sine and cosine series.
Week 12	Solution of the Diffusion equation.

Week 13, 14	Solution of the wave equation.
Week 15	Preparation and Help Session for the Final Exam.

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	• Curriculum and textbook	Yes
Recommended Texts	• Engineering Mathematics", by John Bird, 5th edition, Elsevier Ltd., 2007 • Advanced Engineering Mathematics", by Peter V. O'Neil, 7th Edition, Cengage Learning, 2012	Yes
Websites	None	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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

MODULE DESCRIPTION FORM

Module Information				
Module Title	Engineering Statistics		**Module Delivery**	
Module Type	**Basic**		☒ Theory ☒ Lecture ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	**PE 326**			
ECTS Credits	**4**			
SWL (hr/sem)	**100**			
Module Level	3		**Semester of Delivery**	2
Administering Department	PENG		**College**	CENG
Module Leader			**e-mail**	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail
Peer Reviewer Name	Name		**e-mail**	E-mail
Scientific Committee Approval Date	17/06/2023		**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understanding Statistical Concepts: Introduce students to the fundamental concepts of statistics, such as measures of central tendency, dispersion, probability, and statistical distributions. This provides a solid foundation for

مخرجات التعلم للمادة الدراسية	further statistical analysis. 2. Data Collection and Analysis: Teach students how to collect, organize, and analyze data using appropriate statistical methods and techniques. This includes graphical representation of data, calculation of descriptive statistics, and interpretation of results. 3. Probability and Probability Distributions: Cover the principles of probability theory and the use of probability distributions in engineering applications. Students should learn about discrete and continuous probability distributions, including the binomial, Poisson, and normal distributions. 4. Hypothesis Testing: Familiarize students with the concept of hypothesis testing and its application in engineering. This involves understanding null and alternative hypotheses, selecting appropriate test statistics, determining significance levels, and drawing conclusions based on test results. 5. Regression Analysis: Introduce students to regression analysis, which is widely used in petroleum engineering for modeling and predicting various parameters. Teach them about simple linear regression, multiple regression, and the interpretation of regression coefficients. 6. Design of Experiments: Provide an overview of experimental design principles, including the concept of randomization, control groups, factorial designs, and statistical inference in experiments. This helps students understand how to plan and conduct experiments effectively. 7. Reliability and Quality Control: Explore statistical methods for analyzing reliability and maintaining quality control in petroleum engineering processes. Students should learn about failure analysis, reliability estimation, control charts, and process capability analysis. 8. Statistical Software: Familiarize students with statistical software packages commonly used in engineering, such as R or Python. Teach them how to perform statistical analysis, generate plots, and interpret results using these tools. 9. Real-world Applications: Illustrate the application of statistics in petroleum engineering through relevant case studies and examples. This helps students understand how statistical methods are utilized in areas like reservoir characterization, production optimization, and risk analysis. 10. Critical Thinking and Communication: Develop students' critical thinking skills by encouraging them to evaluate and interpret statistical results critically. Emphasize effective communication of statistical findings through written reports and presentations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the fundamental concepts of statistics, including measures of central tendency, dispersion, probability, and distributions. 2. Apply statistical techniques to analyze and interpret data relevant to petroleum engineering, such as reservoir properties, production rates, and well performance. 3. Evaluate and select appropriate statistical methods for solving engineering problems in the petroleum industry.

	4. Use statistical software tools effectively to analyze large datasets and perform statistical calculations. 5. Apply hypothesis testing techniques to make decisions and draw conclusions about petroleum engineering processes and data. 6. Demonstrate proficiency in regression analysis and its application in modeling and predicting petroleum engineering phenomena. 7. Understand the principles of experimental design and be able to design and analyze experiments to optimize petroleum engineering processes. 8. Interpret and communicate statistical results effectively through technical reports and presentations. 9. Recognize the limitations and assumptions associated with statistical methods and their application in petroleum engineering. 10. Develop critical thinking skills to assess the reliability and validity of statistical analyses and make informed decisions based on statistical evidence in the petroleum industry.
Indicative Contents المحتويات الإرشادية	1. Introduction to Statistics: • Basic concepts and terminology • Data types and measurement scales • Descriptive statistics: measures of central tendency and dispersion 2. Probability Theory: • Introduction to probability • Basic probability rules and axioms • Conditional probability and independence • Probability distributions: discrete and continuous 3. Random Variables and Probability Distributions: • Random variables and their properties • Probability mass functions (PMFs) and probability density functions (PDFs) • Common probability distributions in engineering: • Binomial distribution • Poisson distribution • Normal distribution • Exponential distribution 4. Sampling and Estimation: • Sampling techniques and sample design • Sampling distributions • Point estimation and properties of estimators • Confidence intervals 5. Hypothesis Testing: • Null and alternative hypotheses • Type I and Type II errors • Common test statistics: • Z-test • t-test • Chi-square test

	6. Regression Analysis: • Simple linear regression • Multiple linear regression • Model fitting and interpretation • Residual analysis 7. Design of Experiments: • Basics of experimental design • Factorial designs • Randomized block designs • Analysis of variance (ANOVA) 8. Quality Control: • Statistical process control (SPC) • Control charts • Process capability analysis 9. Reliability and Life Testing: • Reliability concepts • Failure distributions • Life testing experiments 10. Case Studies and Applications: • Real-world engineering applications of statistical analysis • Use of statistical software tools for data analysis

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Actively participate in class: Attend all lectures and actively engage in discussions. Ask questions, seek clarification, and participate in class activities. This will help you understand the concepts better and reinforce your learning. 2. Review prerequisite knowledge: Make sure you have a solid understanding of the prerequisite mathematical concepts, such as calculus and probability theory. If you find any gaps in your knowledge, review the necessary topics before diving into Engineering Statistics. 3. Establish a study schedule: Create a study schedule that allocates dedicated time for studying Engineering Statistics. Break down the topics into manageable chunks and allocate sufficient time for practice problems and review. 4. Practice regularly: Engineering Statistics is best learned through practice. Solve a wide range of problems to reinforce your understanding of concepts and improve your problem-solving skills. Use the textbook, online resources,

	and additional problem sets provided by your instructor. 5. Seek additional resources: If you find certain topics challenging or need further explanation, don't hesitate to seek additional resources. Look for online tutorials, video lectures, or supplementary textbooks that offer alternative explanations or examples. 6. Form study groups: Collaborate with classmates and form study groups. Explaining concepts to others and discussing problem-solving strategies can enhance your understanding and provide different perspectives. You can also share resources and learn from each other's strengths. 7. Utilize office hours: Attend your instructor's office hours or seek help from teaching assistants if you have specific questions or need extra guidance. They can clarify doubts and provide further insight into challenging topics. 8. Review and revise regularly: Don't leave your studying until the last minute. Regularly review and revise the material covered in class to reinforce your understanding and retention of key concepts. 9. Use software tools: Familiarize yourself with software tools commonly used in Engineering Statistics, such as Excel, MATLAB, or statistical software like R or Python. These tools can help you analyze data, perform statistical calculations, and visualize results. 10. Connect theory with real-life applications: As a petroleum engineering student, try to relate the statistical concepts you learn in class to real-life scenarios in your field. Understanding the practical applications of Engineering Statistics can make the subject more engaging and relevant.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Exams**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	5% (5)	2 and 12	LO #3, #4 and #6, #7
	Presentation	1	5% (5)	13	All
	Report	None	None	None	--------
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 and LO #7
	Final Exam	3hr	70% (70)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Oil and gas reserve, organization of petroleum exporting and importing countries,
Week 2	International supply and demand of petroleum,
Week 2, 3	Classification of petroleum, petroleum pricing, alternative energy, international strategy of energy,
Week 4,5	Time value of money, types of interest rates, rate of return,
Week 6,7	Methods of engineering decisions, depreciation, depletion, amortization, taxation, inflation, and quiz.
Week 8,9	Sensitivity analysis of engineering projects,
Week 9	Mid exam
Week 10,11	Risk analysis production decline curves,
Week 12,13	Evaluation of future production of oil and gas wells.

Week 14	**Exam preparation and review**
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Curriculum and textbook	Yes
Recommended Texts	• Engineering Mathematics", by John Bird, 5th edition, Elsevier Ltd., 2007 • Advanced Engineering Mathematics", by Peter V. O'Neil, 7th Edition, Cengage Learning, 2012	Yes
Websites	None	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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

MODULE DESCRIPTION FORM

Module Information				
Module Title	**Engineering Project**		**Module Delivery**	
Module Type	**Basic**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PE 426**			
ECTS Credits	4			
SWL (hr/sem)	**100**			
Module Level	4		**Semester of Delivery**	1 and 2
Administering Department	Type Dept. PE		**College**	Type College Code
Module Leader			**e-mail**	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail
Peer Reviewer Name	Name		**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024		**Version Number**	1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Practical Application: The course aims to provide students with an opportunity to apply the theoretical knowledge they have acquired throughout their studies to a real-world engineering project. This includes understanding the practical aspects of petroleum engineering and the challenges involved in implementing engineering solutions. 2. Project Management Skills: The course aims to develop students' project management skills by guiding them through the different stages of an engineering project. This includes planning, organizing, and executing a project within specified constraints such as time, budget, and resources. 3. Interdisciplinary Collaboration: The course aims to promote interdisciplinary collaboration by encouraging students to work in teams with members from different engineering disciplines. Petroleum engineering projects often require collaboration with geologists, mechanical engineers, environmental engineers, and other specialists. The course aims to enhance students' ability to work effectively in a multidisciplinary team. 4. Problem-Solving and Critical Thinking: The course aims to enhance students' problem-solving and critical thinking skills. Engineering projects often involve complex problems that require creative and analytical thinking to identify and evaluate potential solutions. The course aims to provide students with opportunities to develop these skills through project-based learning. 5. Communication and Presentation Skills: The course aims to improve students' communication and presentation skills, as these are essential for effectively conveying technical information to stakeholders. Students may be required to present their project findings, results, and recommendations in written reports, oral presentations, or other forms of communication. 6. Ethical and Professional Responsibilities: The course aims to raise students' awareness of the ethical and professional responsibilities associated with engineering projects. This includes considerations such as safety, environmental impact, and adherence to relevant codes of conduct. The course aims to foster a sense of professional integrity and accountability in students. 7. Industry Relevance: The course aims to align with industry standards and practices, providing students with insights into current trends and challenges in the petroleum engineering field. This may involve incorporating case studies, guest lectures, or industry visits to provide students with exposure to real-world engineering projects and professional practices.
Module Learning Outcomes	In the fourth-class petroleum engineering project course, students can expect to achieve the following module learning outcomes: 1- Project Planning and Management: Students will learn how to effectively plan and manage engineering projects in the petroleum

مخرجات التعلم للمادة الدراسية	industry. This includes developing project schedules, allocating resources, and understanding the project life cycle. 2- Technical Analysis and Problem Solving: Students will develop advanced skills in technical analysis and problem-solving specific to petroleum engineering projects. They will learn to identify and address engineering challenges, evaluate different solutions, and make informed decisions. 3- Engineering Design and Optimization: Students will gain knowledge and practical experience in designing and optimizing engineering systems and processes within the petroleum industry. They will learn to apply engineering principles, use software tools, and consider factors such as safety, cost-effectiveness, and environmental impact. 4- Data Analysis and Interpretation: Students will acquire the skills to collect, analyze, and interpret data relevant to petroleum engineering projects. They will learn to use statistical techniques and software tools to draw meaningful conclusions and make data-driven decisions. 5- Technical Communication and Presentation: Students will develop effective communication skills, both written and oral, necessary for presenting engineering projects. They will learn to prepare technical reports, project proposals, and deliver presentations to convey complex engineering concepts and findings to diverse audiences. 6- Collaboration and Teamwork: Students will learn to work collaboratively in multidisciplinary teams, simulating real-world project environments. They will develop skills in team dynamics, effective communication, and conflict resolution to achieve project goals collectively. 7- Ethical and Professional Practices: Students will gain an understanding of ethical and professional practices relevant to the petroleum engineering field. They will learn about professional codes of conduct, legal considerations, and ethical decision-making in engineering project management. 8- Industry Awareness: Students will develop knowledge and awareness of current trends, challenges, and technological advancements in the petroleum industry. They will explore case studies, industry best practices, and emerging technologies relevant to petroleum engineering projects.
Indicative Contents المحتويات الإرشادية	1- Project Selection: Students are typically required to identify a specific petroleum engineering project or problem that they will work on throughout the course. This could involve topics such as reservoir characterization, well design, production optimization, or environmental impact assessment. 2- Literature Review: Students conduct a comprehensive review of existing literature and relevant research in their chosen project area. This helps them gain a deeper understanding of the problem and the current state-of-the-art practices and technologies in the field. 3- Project Planning: Students develop a detailed project plan that outlines the objectives, methodology, timeline, and available resources for their

	project. They also identify potential risks and mitigation strategies. 4- Data Collection and Analysis: Depending on the nature of the project, students may be required to collect relevant data from various sources such as field measurements, laboratory experiments, or existing datasets. They analyze the data using appropriate statistical and engineering analysis techniques. 5- Design and Simulation: If the project involves designing a system or optimizing a process, students use specialized software tools and simulations to develop and evaluate different engineering solutions. This could include reservoir modeling, wellbore design, production forecasting, or facility layout optimization. 6- Technical Documentation: Students are expected to maintain detailed records of their work and produce technical reports or presentations that document their project findings, methodologies, and recommendations. This involves effective communication of technical information and graphical representation of data. 7- Project Evaluation: Towards the end of the course, students present their project work to a panel of faculty members and industry professionals who evaluate the quality of their research, analysis, and conclusions. This may include a formal presentation, demonstration of software tools, and answering questions related to the project. 8- Collaboration and Teamwork: In some cases, students may work on group projects, simulating real-world engineering teams. This encourages collaboration, division of tasks, and effective communication within the team.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The engineering project course for fourth-class students in the petroleum engineering department typically focuses on providing students with practical experience in planning, designing, and executing engineering projects related to the petroleum industry. Here are some strategies that could be employed in such a course: 1. Project Selection: Encourage students to select projects that align with their interests and are relevant to the petroleum engineering field. This could involve exploring various topics such as reservoir engineering, drilling operations, production optimization, or petrochemical processes.

	2. Project Planning: Teach students how to develop a comprehensive project plan, including defining project objectives, identifying deliverables, creating a work breakdown structure, and establishing a realistic timeline. Emphasize the importance of setting achievable goals and managing project scope effectively. 3. Research and Analysis: Guide students in conducting thorough research on their chosen project topics. This may involve literature reviews, data collection, and analysis of existing technologies, methodologies, or case studies relevant to the project. Encourage critical thinking and problem-solving skills during this phase. 4. Design and Engineering: Instruct students on the principles of engineering design, including conceptualization, feasibility assessment, and detailed design. Provide guidance on utilizing software tools and simulation techniques commonly used in petroleum engineering, such as reservoir modeling software or drilling simulation software. 5. Collaboration and Teamwork: Emphasize the importance of teamwork and collaboration throughout the project. Assign students to work in teams, allowing them to benefit from diverse perspectives and develop skills in communication, coordination, and conflict resolution. Encourage regular team meetings and progress updates. 6. Implementation and Execution: Provide students with hands-on experience in executing their project plans. This may involve conducting experiments, simulations, or fieldwork, depending on the nature of the project. Encourage students to document their activities, record observations, and analyze results accurately. 7. Risk Management: Teach students to identify and assess potential risks associated with their projects. Emphasize the importance of implementing mitigation measures and contingency plans to minimize or address any unforeseen challenges that may arise during the project's execution. 8. Documentation and Reporting: Guide students in documenting their project activities and outcomes effectively. This may include writing technical reports, creating presentations, and delivering project summaries. Emphasize the importance of clear and concise communication skills in conveying project information. 9. Evaluation and Reflection: Conduct regular evaluations to assess students' progress and provide constructive feedback on their performance. Encourage students to reflect on their learning experiences and identify areas for improvement.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Engineering Projects

Week 2	Project Planning and Initiation
Week 3	Project Organization and Team Formation
Week 4	Project Risk Management
Week 5	Project Scheduling and Resource Management
Week 6	Project Cost Estimation and Budgeting
Week 7	Project Quality Management
Week 8	Project Execution and Monitoring
Week 9	Project Communication and Reporting
Week 10	Project Integration and Scope Management
Week 11	Finalizing project reports and handover procedures
Week 12	Project Case Studies and Presentations: Analyzing and discussing real-world engineering project case studies
Week 13	Project Case Studies and Presentations: Presenting individual or group projects to the class
Week 14	Project Case Studies and Presentations: Q&A sessions and feedback on project presentations
Week 15	Project Case Studies and final Presentations:
Week 16	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**

Required Texts	1- A Hamdy, Operations Research an introduction, Edition, Pearson Prentice Hall, 8th, 2007.	Yes
Recommended Texts	2. Introduction to Operations Research, Seventh Edition/ F.S. Hillier/G. J. Lieberman, Mc Graw-Hill.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

Module Information معلومات المادة الدراسية				
Module Title	Applied Reservoir Engineering		**Module Delivery**	
Module Type	**Basic**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PE 411**			
ECTS Credits	5			
SWL (hr/sem)	**125**			
Module Level	4	**Semester of Delivery**	1	
Administering Department	Type Dept. PE	**College**	Type College Code	
Module Leader		**e-mail**		
Module Leader's Acad. Title	Asst. Professor	**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)	**e-mail**	E-mail	
Peer Reviewer Name	Name	**e-mail**	E-mail	
Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	1-Reservoir management. 2-Production engineering.	**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The aims of the Applied Reservoir Engineering course for fourth-class students in the Petroleum Engineering department are to provide a comprehensive understanding of the principles and techniques used in reservoir engineering and their practical application in the oil and gas industry. The course aims to equip students with the necessary skills and knowledge to analyze and manage reservoirs efficiently. Here are the specific aims of the course: 1. Introduction to Reservoir Engineering: The course aims to introduce students to the fundamental concepts and terminology of reservoir engineering, including the types of reservoirs, fluid properties, and basic reservoir equations. 2. Reservoir Characterization: Students will learn various methods for characterizing reservoirs, including geological, geophysical, and petrophysical techniques. The aim is to develop skills in interpreting and analyzing data to understand reservoir properties and behavior. 3. Fluid Flow in Reservoirs: The course will cover the principles of fluid flow in porous media, including Darcy's law, fluid displacement mechanisms, and multiphase flow. Students will learn to analyze fluid flow behavior in reservoirs and understand the factors affecting production performance. 4. Reservoir Performance Analysis: This part of the course aims to teach students how to analyze reservoir performance using material balance equations, pressure-transient analysis, and production data. The focus is on assessing reservoir productivity, reserves estimation, and optimizing production strategies. 5. Reservoir Simulation: Students will be introduced to reservoir simulation techniques, including numerical models and simulation software. The aim is to develop skills in constructing and using reservoir simulation models to predict reservoir behavior and evaluate

	different development scenarios. 6. Enhanced Oil Recovery (EOR) Techniques: The course will cover various EOR techniques, such as water flooding, gas injection, and chemical methods. Students will learn the principles, advantages, and limitations of each technique and understand their application in improving reservoir recovery. 7. Reservoir Management: The course aims to provide students with an understanding of reservoir management principles, including field development planning, production optimization, and reservoir surveillance. Students will learn to integrate technical, economic, and environmental factors in making informed reservoir management decisions. 8. Field Trips and Case Studies: The course may include field trips to oil and gas fields or visits to industry facilities to provide students with practical exposure and real-life examples. Case studies will be used to illustrate the application of reservoir engineering principles in solving practical problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The Applied Reservoir Engineering course for fourth-class students in the Petroleum Engineering department, students should be able to achieve the following learning outcomes: 1. Understand the fundamentals of reservoir engineering: Students will have a solid understanding of the basic concepts and principles of reservoir engineering, including fluid properties, rock properties, reservoir characterization, and fluid flow in porous media. 2. Analyze reservoir data: Students will be able to interpret and analyze reservoir data, including well logs, pressure data, production data, and core data. They will learn how to use this data to estimate reservoir properties, such as porosity, permeability, and fluid saturations. 3. Perform reservoir performance analysis: Students will learn how to analyze reservoir performance and evaluate reservoir behavior over time. They will be able to use material balance equations, decline curve analysis, and other techniques to estimate reservoir reserves, predict

	production rates, and assess reservoir performance. 4. Design reservoir development strategies: Students will learn how to design reservoir development strategies, including well placement, well spacing, and production strategies. They will understand the impact of various factors, such as reservoir heterogeneity and fluid properties, on reservoir development. 5. Understand reservoir simulation: Students will gain knowledge of reservoir simulation techniques and tools. They will learn how to build reservoir models, perform simulation runs, and analyze simulation results to optimize reservoir performance and make informed decisions regarding reservoir management. 6. Apply enhanced oil recovery (EOR) techniques: Students will learn about various enhanced oil recovery techniques, including water flooding, gas injection, and chemical flooding. They will understand the principles behind these techniques and their application to improve oil recovery from reservoirs. 7. Evaluate economic aspects: Students will be able to evaluate the economic aspects of reservoir engineering projects. They will learn how to estimate project economics, including costs, revenues, and profitability, and use economic indicators to assess the viability of reservoir development projects. 8. Communicate effectively: Students will develop effective communication skills, both written and oral, to convey reservoir engineering concepts and analyses. They will be able to present technical information, collaborate with team members, and prepare professional reports. 9. Apply software tools: Students will gain practical experience in using reservoir engineering software tools commonly employed in the industry. They will be able to apply these tools to perform reservoir analysis, simulation, and design tasks. 10. Understand ethical and environmental considerations: Students will develop an understanding of the ethical and environmental aspects related to reservoir engineering. They will be aware of the importance of sustainable practices, environmental regulations, and social

	responsibility in the oil and gas industry.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The Applied Reservoir Engineering course for fourth-year students in the Petroleum Engineering department focuses on providing students with the knowledge and skills necessary to analyze and optimize hydrocarbon reservoirs. Here are some strategies that can help students excel in the course: 1. Understand Reservoir Fundamentals: Start by developing a strong foundation in reservoir engineering concepts. This includes understanding key terminology, reservoir properties, fluid flow mechanisms, and reservoir characterization techniques. 2. Master Reservoir Simulation: Reservoir simulation is a critical tool in reservoir engineering. Familiarize yourself with the principles and applications of reservoir simulation software. Learn to build and run reservoir simulation models to analyze reservoir performance under various scenarios. 3. Analyze Production Data: Gain proficiency in analyzing production data to assess reservoir performance. Understand techniques such as decline curve analysis, material balance, and pressure transient analysis. Interpret production data to estimate reservoir parameters like initial hydrocarbon in place, reservoir permeability, and reservoir pressure. 4. Study Reservoir Management: Learn about reservoir management strategies, including reservoir monitoring, well spacing, and infill drilling. Understand the impact of production techniques such as primary, secondary, and tertiary recovery methods. Evaluate reservoir

management practices to maximize hydrocarbon recovery.

5. Work on Case Studies: Engage in practical case studies that simulate real-world reservoir engineering scenarios. Analyze field data, design reservoir development plans, and optimize production strategies. This will help you apply theoretical concepts to practical situations and develop problem-solving skills.
6. Collaborate and Communicate: Reservoir engineering often involves teamwork and collaboration. Engage in group projects and discussions to enhance your ability to work effectively with others. Improve your communication skills by presenting technical information clearly and concisely.
7. Stay Updated with Industry Trends: Follow industry publications, research papers, and conferences to stay abreast of the latest advancements in reservoir engineering. Understand emerging technologies, enhanced recovery methods, and reservoir management practices being implemented in the industry.
8. Utilize Software and Tools: Familiarize yourself with industry-standard software and tools used in reservoir engineering, such as Eclipse, CMG, or Petrel. Practice using these tools to perform reservoir simulations, reservoir characterization, and data analysis.
9. Seek Mentorship and Guidance: Connect with professors, industry professionals, and senior students who have experience in reservoir engineering. Seek their guidance and mentorship to deepen your understanding and gain insights from their practical experience.
10. Practice Problem Solving: Solve a variety of reservoir engineering problems and exercises to reinforce your understanding of concepts. Work on sample problems, textbook exercises, and past exam papers to improve your problem-solving skills.

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to Applied Reservoir Engineering.
Week 2	Fundamental concepts and introduction to depletion drive, gas cap drive, water drive, gravity

	drainage reservoir, combination drive reservoir,
Week 3	Maintenance, secondary recovery, gas reservoir, gas condensate reservoir, miscellaneous subject
Week 4	Oil reservoir and application of Material Balance Equation
Week 5	material balance equation Applications in Gas Reservoirs
Week 6	Single Phase Gas Reservoir
Week 7	Mid term exam
Week 8	Gas Condensate Reservoir
Week 9	Material Balance Equation in Oil Reservoirs
Week 10	Under-saturated & Saturated Oil Reservoirs
Week 11	Water influx
Week 12	Oil Well Performance and MBE
Week 13	Driving Mechanisms and driving indices
Week 14	Final Project and Review Students work on a final project related to Applied Reservoir Engineering. Review of key concepts and topics covered throughout the course. Discussion and presentation of final projects.
Week 15	Exam preparation and review. **Preparatory week before the final Exam**
Week 16	**FINAL EXAM**

Grading Scheme				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very	جيد جدا	80 - 89	Above average with some errors

(50 - 100)	Good			
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="3">Directional Drilling</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 412</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">125</td></tr>
<tr><td colspan="2">Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td colspan="2"></td><td>e-mail</td><td colspan="2"></td></tr>
<tr><td colspan="2">Module Leader’s Acad. Title</td><td></td><td colspan="2">Module Leader’s Qualification</td><td></td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>Production engineering</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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<table>
<tr><th colspan="2">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Aims
أهداف المادة الدراسية</td><td>The Directional Drilling Module is designed to build a firm foundation in the principles and practices of directional drilling, calculations, and planning for directional and horizontal wells. Specific problems associated with directional/horizontal drilling such as torque, drag, hole cleaning, and drill string component design are included.

students will receive instruction on planning and evaluating horizontal wells based on the objectives of the horizontal well. The basic applications and techniques for multi-lateral wells are covered in the course. Additionally, they will become familiar with the tools and techniques used in directional drilling such as survey instruments, bottom hole assemblies, motors, steerable motors, and steerable rotary systems. students will be able to predict wellbore path based on historical data and determine the requirements to hit the target.</td></tr>
<tr><td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td>Having worked through this module the student will be able to:

General:

• List and describe the applications of directional drilling techniques

• Describe the constraints on the trajectory of a deviated well.

• Define the terms: KOP; BUR; and tangent section of the well trajectory.

Trajectory Design:

• Calculate the: along hole depth, TVD and departure of the end of the build up section and the along hole depth of the bottom of the hole in a build and hold well profile.

Survey Calculations:

• Describe the mathematical models used to describe and calculate the well trajectory: Tangential; balanced tangential; average angle; radius of curvature; and minimum curvature.

• Describe the procedure used to calculate and plot survey results.

• Calculate the northing, easting, TVD, vertical section and dogleg severity of a</td></tr>
</table>

	survey station using the average angle method. **Surveying Techniques:** • Describe the construction and operation of a magnetic single shot ,magnetic multi-shot, gyroscopic single and multi- shot,. **Deflection Tools** • Describe the principles used in the deflection of a wellbore from a given trajectory. • List and describe the tools used to initiate changes in wellbore trajectory. • Describe the principles associated with the packed hole, pendulum and fulcrum BHA and when each would be used. • Describe the component parts of a steerable drilling system and the mode of operation of such a system. **PDM's and Turbodrills:** • Describe the principles of operation of a PDM and Turbodrill.. **Horizontal and multilateral wells:** • List and describe the types and the applications of horizontal wells. • Calculate the: along hole depth, TVD and departure of the end of the build up section and the along hole depth of the bottom of the hole in a build and hold well profile. **Torque and drag in horizontal wells:** • Calculate torque and drag while drilling and while tripping in different horizontal well profiles.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through

	classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Directional drilling Overview the applications of directional drilling. Principle terminology in directional drilling. Types and applications of different directional well profiles.
Week 2	Directional well planning Reference Systems and Coordinates Planning the well trajectory.
Week 3	Surveying calculations -1 Tangential method. Balance Tangential method. Average angle method.
Week 4	Surveying calculations-2 Radius of curvature method. Minimum curvature method.
Week 5	Directional wells Design-1 Type-1 (build& hold)- well profile design and calculations. Quiz
Week 6	Directional wells Design-2 Type-2 (S-shape) well-profile design and calculations
Week 7	Directional surveying tools Inclination surveying tools Magnetic Single shot (MSS Magnetic Multi-shot (EMS) Gyroscope(Conventional, North seeking and inertial)

Week 8	Directional well deflection- tools-1 Down hole motors (Turbines, Positive displacement motors (PDM) whipstocks jetting action
Week 9	Directional well deflection tools-2 Down hole motors and bent sub Steerable positive displacement motors Rotary steerable system (RSS)
Week 10	Bottom hole Assemble (BHA) design for directional wells Pendulum assembly Packed bottom hole assembly Rotary build assembly Rotary drop assembly Steerable assembly Mud motor and bent sub assembly
Week 11	Horizontal and multi-lateral wells Types and applications of horizontal and multi-lateral wells Profiles of horizontal wells .
Week 12	Well profile and Design considerations of horizontal wells Design and calculations of single-build horizontal well Design and calculations of Double-build horizontal well
Week 13	Torque and drag while directional drilling Calculation of Torque while rotating of bottom. Calculation of Torque while rotating on bottom. Calculation of drag while drilling and tripping.
Week 14	Hole cleaning considerations in deviated and horizontal wells Discus and analysis the effect of hole cleaning on horizontal drilling performance
Week 15	Final Project and Exam Preparation Completion of a directional drilling project. Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	*HORIZONTAL AND DIRECTIONAL DRILLING* by Richard S. Carden and Robert D. Grace	Yes
Recommended Texts	Well engineering and construction by H. Rabia Applied drilling Engineering by Adam T. Bourgoyne	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="3">Well test</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 431</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">5</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">125</td></tr>
<tr><td>Module Level</td><td></td><td colspan="2">Semester of Delivery</td><td colspan="2">1</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td>Mohammed Abdul Ameer</td><td>e-mail</td><td colspan="3">Dr.alhumairi@uomisan.edu.iq</td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
</table>

<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Production engineering</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
</table>

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Oil Well Test Module is designed to provide students with an in-depth understanding of the principles and techniques involved in testing oil wells. The module covers various aspects of well testing, including planning, design, execution, and interpretation of tests. Students will learn about the equipment and methods used in well testing, as well as the analysis of data obtained from these tests. The module also emphasizes the importance of well testing in reservoir characterization, production optimization, and reservoir management.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The Well Test module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess reservoir potential, optimize well performance, and make informed decisions regarding production strategies. Well test analysis helps determine reservoir parameters, evaluate well productivity, identify formation damage, and validate reservoir models. The module also emphasizes the significance of data quality, accuracy, and integrity in well testing, ensuring reliable results for reservoir characterization and production forecasting.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Well Testing Overview of well testing objectives and applications Types of well tests: drill stem tests, production tests, interference tests.
Week 2	Reservoir Properties and Wellbore Storage Reservoir properties affecting well test analysis Wellbore storage effects and correction methods.
Week 3	Well Test Design and Planning Role of Oil Well Tests and Information in Petroleum Industry
Week 4	History of Oil Well Testing and Uses of Oil Well Tests
Week 5	Well Test Execution Procedures for conducting well tests Oil Well Test Data Acquisition, Analysis, and Management Quiz
Week 6	Pressure Transient Analysis Pressure transient behavior and analysis techniques Pressure buildup and drawdown tests
Week 7	Exercise to constructing well test (build up test)
Week 8	Pressure Drawdown Testing
Week 9	Exercise to constructing drawdown test.
Week 10	Multi -rate and Multilayer Well Test Analysis Analysis techniques for multi-rate and multilayer reservoirs Interpretation challenges and solutions. Quiz.
Week 11	Two phase flow through pipes (different methods)
Week 12	Two phase flow exercise and application different methods

Week 13	Water cut calculation and control the well production. Original and Average Reservoir Pressure Estimation Methods
Week 14	Final Project and Exam Preparation Completion of a well test project Exam preparation and review
Week 15	Preparatory week before the final Exam
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	John Lee	Yes

Recommended Texts		No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

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<tr><td>Module Title</td><td colspan="3">Secondary Oil Recovery (SOR) and enhanced oil recovery (EOR)</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Core</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 414</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">150</td></tr>
<tr><td colspan="2">Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td colspan="2">Mohammed Abdul Ameer</td><td>e-mail</td><td colspan="2">Dr.alhumairi@uomisan.edu.iq</td></tr>
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<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
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Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Oil Well Test Module is designed to provide students with an in-depth understanding of the principles and techniques involved in testing oil wells. The module covers various aspects of well testing, including planning, design, execution, and interpretation of tests. Students will learn about the equipment and methods used in well testing, as well as the analysis of data obtained from these tests. The module also emphasizes the importance of well testing in reservoir characterization, production optimization, and reservoir management.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The Well Test module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess reservoir potential, optimize well performance, and make informed decisions regarding production strategies. Well test analysis helps determine reservoir parameters, evaluate well productivity, identify formation damage, and validate reservoir models. The module also emphasizes the significance of data quality, accuracy, and integrity in well testing, ensuring reliable results for reservoir characterization and production forecasting.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving

	some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered

Week 1	Introduction to Reservoir rock properties Main reservoir rock properties Geological classification of porosity, Methods used for measuring porosity. Methods used for averaging permeability. Methods used to measure Wettability (Amott Index).
Week 2	Introduction to Secondary oil recovery methods Oil Recovery Stages, Selection the Best EOR Methods (Screening Criteria). Water Injection (Technical factors and Economic factors). The goal of water flooding, factors to consider in water flooding)
Week 3	Water Flooding Candidate for water flooding, Advantage and dis advantage of water flooding. Sources and Treatment of Injected Water, Typical Water Flood Project. Optimum time to water flood.
Week 4	Buckley and Leverett Theory Overall recovery efficiency (Displacement, vertical and areal sweep efficacies). Fractional flow equation (Derivation, applications and examples). Effect of Water and Oil Viscosities, effect of Dip Angle and Injection Rate. Derivation the relationship between water cut and water oil ratio.
Week 5	Factors effecting on fractional flow curve Effect of Water and Oil Viscosities, effect of Dip Angle and Injection Rate. Derivation the relationship between water cut and water oil ratio. quiz
Week 6	Frontal Advance Equation Derivation of distance vs time relationship. Water saturation profile during water flooding. quiz
Week 7	Oil Recovery Calculations Data preparation Recovery performance to breakthrough Recovery performance after breakthrough

Week 8	Reservoir Heterogeneity Dykstra-Parson's method Vertical Heterogeneity Dykstra-Parson's permeability variation V (Tutorial example). Lorenz coefficient L
Week 9	Methods of predicting recovery performance for layered reservoirs. Simplified Dykstra–Parsons Method Modified Dykstra–Parsons Method
Week 10	Calculation Vertical Sweep Efficiency. Vertical Sweep Efficiency (Stiles' Method) Vertical Sweep Efficiency (The Dykstra-Parsons Method) Quiz.
Week 11	Calculation Areal Sweep Efficiency Factors affecting Areal Sweep Efficiency. Areal Sweep Efficiency (Before, At and After Breakthrough). Fluid Injectivity
Week 12	Selection of flooding patterns Irregular Injection Patterns and Regular injection patterns Peripheral injection patterns and Crestal and basal injection patterns
Week 13	Exams Mid- Term exam.
Week 14	Gas Injection The Displacement of Oil by Gas, with Gravitational Segregation The Displacement of Oil by Gas, without Gravitational Segregation
Week 15	Final Project and Exam Preparation Completion of a secondary oil recovery project Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws
Week 3	Lab 3: First-Order Transient Responses
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: Frequency Response of RC Circuits
Week 6	Lab 6: Frequency Response of RLC Circuits
Week 7	Lab 7: Filters

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Tarek Ahmed PhD PE - Reservoir Engineering Handbook, Third Edition (2006, Gulf Professional Publishing.	Yes
Recommended Texts		No
Websites	https://petrowiki.spe.org/Waterflooding	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

	C - Good	جيد	70 - 79	Sound work with notable errors
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	**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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Reservoir Management		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	PE 331			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	4		Semester of Delivery	1
Administering Department	Type Dept. PE		College	Type College Code
Module Leader	Hasan Hussein		e-mail	Dr.hassan@uomisan.edu.iq
Module Leader's Acad. Title			Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/10/2024		Version Number	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Reservoir Simulation- Reservoir Engineering- Reservoir Geology- Production Engineering- Drilling Engineering	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Reservoir Management Module is designed to provide students with key knowledge of how to manage an actual oil reservoir via modeling various upstream processes. The module targets modeling actual field data, and discussing wide range of variables that affect fluid flow behavior in porous media.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• This module will raise virtually all of the technical terms and concepts and many of the issues that will be studied in more detail later in this course. • Have an elementary knowledge of how uncertainty is handled in reservoir simulation. • Know in detail and be able to compare the differences between what reservoir simulations can do at the appraisal and in the mature stages of reservoir development. • Be aware of the effects of heterogeneity on two-phase fl ow. • Know how to upscale from the core-scale to the scale of a geological model, taking account of fi ne-scale structure and capillary effects. • Appreciate the different types of model used to predict single phase permeability • Describe the pore-scale physics characterising drainage and imbibition processes in porous media • Generating Petrophysical Properties for Reservoir Simulation • Wettability - Concepts and Applications • Explain how wettability variations affect waterflooding at the pore-scale • List “Craig’s Rules of Thumb” in the context of water-wet and oil-wet relative permeability curves
Indicative Contents	

المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is by explaining the theoretical and practical aspects of how to model an actual oil reservoir and discussing potential technical challenges that reservoir engineers may encounter as they work through modeling a certain oil field. Encouraging students to work in groups to models various reservoir processes. Exploring new ideas introduce by students of how to develop a given mature field and discuss that as peers, as well as with the course teacher , and write scientific report as research groups. Through this course, teaching staff would encourage students to develop their ability of critical thinking and working in team.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية				
	Time/Nu	**Weight (Marks)**	**Week Due**	**Relevant Learning**

		mber			Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Reservoir management • What is a reservoir management? • Reservoir Life cycle • Objectives of Reservoir Management • Follow Up questions • Reservoir Management Teamwork • Integration of Geoscience & Engineering • Integration Exploration and Development Technology • Reservoir Management Process • Setting Goals • Reservoir characteristics
Week 2	Permeability upscaling of Single-phase flow • Introduction • Upscaling Porosity and Water Saturation • Averaging Permeability • Flow Parallel to Uniform Layers • Flow Across Uniform Layers • Flow through Correlated Random Fields • Additional Averaging Methods • Summary of Permeability Averaging
Week 3	Permeability upscaling of Single-phase flow II • Numerical Methods • Recap on Flow Simulation • Boundary Conditions • Upscaling Errors • Correlated Random Fields • Evaluating the Accuracy of Upscaling • Upscaling of a Sand/Shale Model • Summary of Single-Phase Upscaling
Week 4	Permeability upscaling of Two-phase flow • Introduction • Applying Single-Phase Upscaling to a Two-Phase Problem • Improving Single-Phase Upscaling • Non-Uniform Upscaling • Well Drive Upscaling • Introduction to Two-Phase Upscaling • Steady-State Methods

	• Capillary-Equilibrium
Week 5	Permeability upscaling of Two-phase flow: Dynamic Methods • Introduction • The Kyte and Berry Method • Discussion on Numerical Dispersion • Disadvantages of the Kyte and Berry Method • Alternative Methods • Example of the PVW Method • Summary of Two-Phase Flow
Week 6	Additional Topics of upscaling • Upscaling at Wells • Permeability Tensors • Flow Through Tilted Layers • Simulation with Full Permeability Tensors • Small-Scale Heterogeneity
Week 7	Geopseudo upscaling Method • The Geopseudo Method • Capillary-Dominated Flow • Geopseudo Example • When to use the Geopseudo Method • Uncertainty and Upscaling • Upscaling Summary
Week 8	Geostatistics principles for Simulation • Introduction • Deterministic permeability models • Stochastic permeability models
Week 9	Geostatistics principles for Simulation II • Gaussian models • Kriging method for permeability and porosity distribution • Cokriging method for permeability and porosity distribution
Week 10	Modelling single-phase flow at the pore-scale - a brief overview • Deviations from Darcy's Law • Empirical Models • Probabilistic Models • Capillary Bundle Models • First Principles Derivation of Carmen-Kozeny Model • Network Modelling Techniques
Week 11	Modelling multiphase flow at the pore-scale • Capillary Pressure — What Does it Mean and When is it Important? • Steady-and Unsteady-State Flow • Drainage at the Pore-Scale • Imbibition at the Pore-Scale

	• The Pore Doublet Model • Introduction to Percolation Theory • Network Modelling of Multiphase Flow
Week 12	Empirical and theoretical approaches to generating petrophysical properties for reservoir simulation • Methods for Generating Capillary Pressure Curves and Pore Size Distributions • Methods for Generating Relative Permeabilities • Hysteresis Phenomena
Week 13	Wettability - concepts and applications • Introductory Concepts • Wettability Measurement and Classification • The Impact of Wettability on Petrophysical Properties • Network Modelling of Wettability Effects
Week 14	Closing remarks for reservoir case study • Open discussion regard to modeling work, outcome results and conclusion given by students
Week 15	Final Project and Exam Preparation • Completion of Reservoir management Simulation reports • Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: – Introduction to the case study - Use of Material Balance to calculate IOIP and system porosity
Week 2	Lab 2: Adjust history matching parameters to give correct water production rate
Week 3	Lab 3: Predict optimum development strategy for remainder of field life
Week 4	Lab 4: continue working on development strategy for the field
Week 5	Lab 5: introduction to Petrel

Week 6	Lab 6: Building random distribution permeability model and run Eclipse to investigate the effect of flow behavior
Week 7	Lab 7: Continue wiring on various realizations for permeability models
Week 8	Lab 8: Using Kriging and Cokriging to build permeability model
Week 9	Lab 9: Deterministic permeability model
Week 10	Lab 10: Investigating the effect of stochastic and deterministic models on flow behavior
Week 11	Lab11: review for the various models
Week 12	Lab12: Open discussion for the final report
Week 13	Lab13: students (group A) to deliver presentation for their work
Week 14	Lab14: Students (Group B) to deliver presentation for their work.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**

Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Optimization**		**Module Delivery**		
Module Type	**Basic**		☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**		
Module Code	**PE 416**				
ECTS Credits	5				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	1	
Administering Department	Type Dept. PE		**College**	Type College Code	
Module Leader	Mudhaffar Yacoub Hussein		**e-mail**	myhussein2017@uomisan.edu.iq	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/10/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	1-Reservoir management.	**Semester**	

	2-Production engineering.		
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Course Objectives: - To introduce students to the concept and importance of optimization. - To provide an understanding of the applications of optimization in various fields. - To develop knowledge and skills in linear programming and its formulation. - To explore the graphical method and simplex method for solving linear programming problems. - To understand the applications of the simplex method in optimizing complex systems. - To introduce the transportation method and its significance in optimization. - To explore nonlinear programming and its techniques for solving optimization problems. - To familiarize students with the Lagrange multiplier method and its role in constrained optimization. - To examine the applications of the Lagrange multiplier method in economics, physics, and other domains.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Learning Outcomes: - Understand the concept and importance of optimization. - Apply linear programming techniques to formulate and solve optimization

	problems. - Utilize the graphical method to solve linear programming problems and analyze real-world applications. - Apply the simplex method to solve linear programming problems and optimize complex systems. - Model and solve transportation problems using optimization techniques. - Analyze and solve nonlinear programming problems using appropriate algorithms. - Apply the Lagrange multiplier method to solve constrained optimization problems. - Understand the applications of optimization in various fields such as logistics, supply chain management, economics, and physics.
Indicative Contents المحتويات الإرشادية	- Introduction to optimization: - Concept and importance of optimization. - Applications of optimization in various fields. - Linear Programming: - Fundamental concepts of linear programming. - Formulation and solution of linear programming problems. - Applications of linear programming in real-world scenarios. - Graphical method: - Solving linear programming problems using graphical representation. - Applications of the graphical method in optimization. - Simplex Method: - Understanding the simplex method algorithm. - Applying the simplex method to solve linear programming problems. - Mathematical foundations and steps involved in the simplex method.

	- Real-world applications of the simplex method in optimizing complex systems. - Transportation Method: - Significance of the transportation problem in optimization. - Modeling and solution of transportation problems using optimization techniques. - Applications of the transportation method in logistics and supply chain management. - Nonlinear Programming: - Differences between linear programming and nonlinear programming. - Techniques and algorithms for solving nonlinear programming problems. - Applications of nonlinear programming in various fields. - Lagrange Multiplier Method: - Understanding the Lagrange multiplier method. - Formulating and solving optimization problems using the Lagrange multiplier method. - Applications of the Lagrange multiplier method in economics, physics, and other domains.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching Strategies for the Optimization Course:

	1. Lecture-Based Instruction: - Delivering comprehensive lectures to introduce key concepts and theories related to optimization. - Providing explanations, examples, and illustrations to enhance understanding. - Engaging students through interactive discussions and Q&A sessions. 2. Problem-Solving Exercises: - Assigning regular problem sets to reinforce understanding and application of optimization techniques. - Providing step-by-step guidance and feedback on problem-solving approaches. - Encouraging students to work collaboratively on challenging problems to promote critical thinking and problem-solving skills. 3. Case Studies and Real-World Examples: - Integrating case studies and real-world examples to demonstrate the practical applications of optimization in various fields. - Analyzing and discussing the optimization strategies employed in real-life scenarios. - Encouraging students to identify optimization opportunities and propose effective solutions. 4. Computer-Based Simulations and Modeling: - Utilizing computer software and simulations to create virtual optimization scenarios. - Guiding students through hands-on exercises to model and solve optimization problems using appropriate software tools. - Analyzing and interpreting simulation results to draw meaningful conclusions. 5. Group Projects and Presentations:

	- Assigning group projects that require students to apply optimization techniques to solve complex problems. - Providing clear guidelines and expectations for project deliverables. - Encouraging students to present their findings and solutions to the class, promoting communication and presentation skills. 6. Guest Lectures and Industry Experts: - Inviting guest speakers from relevant industries or academic institutions to share their experiences and expertise in optimization. - Organizing panel discussions or Q&A sessions with industry experts to provide real-world insights and perspectives. 7. Continuous Assessment and Feedback: - Conducting regular quizzes, tests, or online assessments to evaluate students' understanding and progress. - Providing constructive feedback on assignments and assessments to support students' learning and improvement. - Offering opportunities for one-on-one discussions or office hours to address individual students' questions and concerns. 8. Resources and Supplementary Materials: - Recommending textbooks, articles, online resources, and academic papers related to optimization. - Providing access to relevant software tools, tutorials, and online platforms for further exploration and self-study. 9. Field Trips and Site Visits: - Organizing field trips or site visits to companies or organizations utilizing optimization techniques in their operations. - Allowing students to observe optimization strategies in action and interact with professionals working in the field. 10. Continuous Learning and Professional Development:

	- Encouraging students to stay updated with the latest advancements and research in optimization through self-directed learning. - Providing resources and guidance for attending conferences, workshops, or webinars related to optimization. .

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11

assessment	**Assignments**	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction.
Week 2	Applications in optimization.
Week 3	Linear programming.
Week 4	Applications in linear programming.
Week 5	Graphical method.

	Quiz
Week 6	Applications in graphical method.
Week 7	Midterm Exam
Week 8	Simplex method. 1
Week 9	Application in Simplex method.
Week 10	Transportation method. Quiz.
Week 11	Application in transportation method.
Week 12	Nonlinear programming.
Week 13	Applications in nonlinear programming..
Week 14	Lagrange multiplier method.
Week 15	Applications in Lagrange multiplier method. Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	

Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم و التدريس		
	Text	**Available in the Library?**
Required Texts	1- A Hamdy, Operations Research an introduction, Edition, Pearson Prentice Hall, 8th, 2007.	Yes
Recommended Texts	2. Introduction to Operations Research, Seventh Edition/ F.S. Hillier/G. J. Lieberman, Mc Graw-Hill.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit

(0 – 49)				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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Applied Reservoir Engineering			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PE 421**				
ECTS Credits	5				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**		2
Administering Department	Type Dept. PE		**College**	Type College Code	
Module Leader			**e-mail**		
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	1/10/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	1-Reservoir management.	**Semester**	

	2-Production engineering.		
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Understand the Fundamentals: The course aims to provide students with a solid understanding of the fundamental concepts and principles related to reservoir characterization. This includes topics such as reservoir properties, fluid behavior, rock types, and basic geological concepts. 2. Data Acquisition and Analysis: Students will learn various methods and techniques for data acquisition and analysis in reservoir characterization. This includes studying well logs, core samples, seismic data, and other relevant data sources to understand reservoir properties and behavior. 3. Reservoir Description: The course aims to teach students how to describe reservoirs accurately. This involves interpreting and integrating various data sets to build a comprehensive reservoir description. Students will learn about techniques such as petrophysics, geostatistics, and reservoir modeling. 4. Reservoir Heterogeneity: Students will study the concept of reservoir heterogeneity and its impact on fluid flow behavior. They will learn how to identify and characterize different reservoir heterogeneities and their effect on production performance. 5. Fluid Flow Simulation: The module aims to introduce students to reservoir simulation techniques, which involve building mathematical models to simulate fluid flow behavior in reservoirs. Students will learn how to use reservoir simulation software to predict reservoir performance and optimize production strategies.

	6. Uncertainty and Risk Analysis: Students will gain an understanding of uncertainty and risk analysis in reservoir characterization. They will learn how to assess and quantify uncertainties associated with data interpretation and modeling, and how to incorporate risk analysis into decision-making processes. 7. Reservoir Management: The course aims to provide students with an overview of reservoir management principles and strategies. Students will learn about production optimization, enhanced oil recovery techniques, and reservoir monitoring methods. 8. Integration of Multiple Disciplines: Reservoir characterization involves integrating knowledge from various disciplines such as geology, geophysics, petrophysics, and reservoir engineering. The module aims to develop students' ability to integrate information from these different fields and apply it to practical reservoir characterization problems. 9. Practical Applications: The course aims to expose students to real-world case studies and practical applications of reservoir characterization techniques. This may involve analyzing and interpreting real data sets, conducting field visits, or working on industry-related projects. 10. Communication and Reporting: The module aims to enhance students' communication skills, both written and oral, in the context of reservoir characterization. Students will learn how to effectively present their findings and recommendations through technical reports, presentations, and discussions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding of Reservoir Characterization: Students will demonstrate a comprehensive understanding of the principles and concepts of reservoir characterization, including the geological, geophysical, and engineering aspects involved. 2. Data Acquisition and Analysis: Students will learn to acquire, analyze, and interpret various types of data, such as well logs, seismic data, core samples, and production data, to characterize reservoir properties and behavior. 3. Geological Modeling: Students will be able to construct accurate

	geological models of subsurface reservoirs based on available data, incorporating geological structures, lithology, and stratigraphy. 4. Petrophysical Analysis: Students will develop skills in performing petrophysical analysis to determine reservoir properties, such as porosity, permeability, and fluid saturations, using well log data and core samples. 5. Reservoir Simulation: Students will gain proficiency in using reservoir simulation software to model fluid flow behavior within the reservoir, optimize production strategies, and assess reservoir performance under different scenarios. 6. Reservoir Performance Prediction: Students will learn techniques to predict reservoir performance, including estimating reserves, analyzing well performance, and evaluating the impact of various reservoir management strategies. 7. Uncertainty and Risk Analysis: Students will understand the importance of uncertainty and risk analysis in reservoir characterization, and will be able to apply statistical methods and probabilistic approaches to quantify and manage uncertainties in reservoir models and predictions. 8. Reservoir Management and Field Development Planning: Students will develop skills in designing and implementing effective reservoir management plans and field development strategies, considering economic, technical, and environmental factors. 9. Effective Communication and Collaboration: Students will enhance their communication skills by effectively presenting and discussing reservoir characterization results, collaborating with multidisciplinary teams, and preparing technical reports and presentations. 10. Ethical and Professional Practice: Students will demonstrate ethical awareness and adhere to professional standards in conducting reservoir characterization studies, including data confidentiality, intellectual property rights, and responsible use of technology. 11.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Data Acquisition and Analysis: Students will learn about various data acquisition techniques such as well logging, seismic surveys, and core analysis. They will also understand how to interpret and analyze these data sets to extract relevant reservoir information. 2. Rock and Fluid Properties: This part of the course focuses on studying the properties of reservoir rocks and fluids. Students will learn about porosity, permeability, capillary pressure, and other essential rock properties. They will also understand fluid behavior, including phase behavior and fluid flow mechanisms in porous media. 3. Petrophysical Analysis: This involves integrating data from well logs, core samples, and seismic data to determine reservoir properties. Students will learn how to interpret well logs, calculate petrophysical properties, and identify hydrocarbon-bearing zones within the reservoir. 4. Reservoir Modeling: Students will be introduced to reservoir modeling techniques, which involve building a 3D representation of the subsurface reservoir. They will learn about grid construction, property modeling, and upscaling techniques to create accurate reservoir models for simulation studies. 5. Reservoir Simulation: This part of the course focuses on using numerical simulation tools to model fluid flow in the reservoir. Students will learn about the principles of reservoir simulation, understand the mathematical models used, and gain hands-on experience with industry-standard software. 6. Uncertainty and Risk Analysis: Reservoir characterization involves dealing with uncertainties and risks associated with data interpretation and modeling. Students will learn about different uncertainty analysis

	techniques and methods to quantify and manage risk in reservoir characterization studies. 7. Reservoir Characterization Workflows: The course will introduce students to industry-standard workflows for reservoir characterization. They will learn how to integrate various data sources, analyze data, and make informed decisions in the reservoir characterization process. 8. Case Studies and Field Trips: To provide practical insights, the course may include case studies from real-world reservoirs and field trips to operating oil and gas fields. This hands-on experience helps students apply the knowledge gained in the classroom to real-life scenarios.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10

Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Reservoir Characterization.
Week 2	Introduction to Petrophysical Rock Properties: CAL, SCAL.
Week 3	Introduction to Petrophysical Rock Properties: Wireline methods, and seismic inversion.
Week 4	Rock-Fabric Classification
Week 5	Depositional Textures
Week 6	Depositional Petrophysics
Week 7	Mid term exam

Week 8	Reservoir Data Reconciliation.
Week 9	Reservoir Mapping, and Volumetric.
Week 10	Reservoir Characterization Workflow
Week 11	Reservoir Characterization Workflow
Week 12	• Reservoir Classification.
Week 13	• Reservoir Classification.
Week 14	Final Project and Review Students work on a final project related to Applied Reservoir Engineering. Review of key concepts and topics covered throughout the course. Discussion and presentation of final projects.
Week 15	Exam preparation and review. **Preparatory week before the final Exam**
Week 16	**FINAL EXAM**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم و التدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts	.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
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	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Drilling Optimization		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	PE 422			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	4		Semester of Delivery	2
Administering Department	Type Dept. PE		College	Type College Code
Module Leader	Mohammed Abdul Ameer		e-mail	Dr.alhumairi@uomisan.edu.iq
Module Leader's Acad. Title	Asst. Professor		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	1/10/2024		Version Number	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Production engineering	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Drilling Optimization course aims to provide students in the fourth class of the Petroleum Engineering department with a comprehensive understanding of the principles and techniques involved in optimizing drilling operations in the oil and gas industry. The course focuses on equipping students with the necessary knowledge and skills to enhance drilling efficiency, reduce costs, and maximize productivity. Throughout the course, students will engage in practical exercises, case studies, and simulations to reinforce their understanding of drilling optimization concepts and apply them to real-world drilling scenarios. The aim is to equip students with the necessary skills to optimize drilling operations, improve drilling performance, and contribute to the overall efficiency and success of oil and gas drilling projects.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The module learning outcomes for this course are as follows: Understand drilling fundamentals: Students will acquire a strong foundation in drilling principles, including the types of drilling methods, equipment used, and drilling processes involved in the oil and gas industry. They will learn about the various components of a drilling rig and their functions. Analyze drilling parameters: Students will learn how to analyze and interpret drilling parameters, such as rate of penetration, weight on bit, rotary speed, and mud properties. They will understand the significance of these parameters and how they impact drilling performance. Optimize drilling performance: Students will be able to identify drilling challenges and apply optimization techniques to improve drilling performance. They will learn about different optimization strategies, such as bit selection, drillstring design, and mud

	system optimization, to achieve efficient and cost-effective drilling operations. Utilize drilling software: Students will gain hands-on experience with drilling software commonly used in the industry. They will learn how to input drilling parameters, analyze data, and interpret the results obtained from these software tools. This will enable them to make informed decisions and optimize drilling operations. Implement drilling best practices: Students will understand the importance of implementing best practices in drilling operations. They will learn about safety protocols, environmental considerations, and regulatory compliance in the context of drilling optimization. They will be able to assess and mitigate drilling risks effectively. Collaborate in drilling optimization projects: Students will develop teamwork and collaboration skills by working on drilling optimization projects in groups. They will learn how to analyze complex drilling problems, propose solutions, and present their findings to a professional audience. Evaluate drilling performance: Students will learn how to evaluate drilling performance through the analysis of drilling data and post-drilling reports. They will be able to identify areas for improvement and implement corrective measures to enhance future drilling operations. By the end of the course, students should have a solid understanding of drilling optimization techniques and be equipped with the skills necessary to optimize drilling operations in the oil and gas industry.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

	The drilling optimization course for fourth-class petroleum engineering students focuses on enhancing their understanding of drilling operations and equipping them with strategies to optimize drilling processes. Here are some brief descriptions of strategies covered in the course: Planning and Design: Students learn how to plan and design drilling operations effectively. This involves considering factors such as well trajectory, target depth, formation characteristics, and drilling equipment selection. By creating a comprehensive plan, engineers can optimize drilling performance and minimize costs. Real-time Monitoring: The course emphasizes the importance of real-time monitoring during drilling operations. Students learn to utilize various technologies and instruments to collect data on drilling parameters, formation characteristics, and wellbore stability. Analyzing this data helps identify potential issues and enables timely adjustments to optimize drilling performance. Drilling Fluids Optimization: Drilling fluids play a crucial role in maintaining wellbore stability, controlling pressure, and carrying drilled cuttings to the surface. Students learn about different types of drilling fluids and their properties. They explore strategies to optimize fluid selection, formulation, and maintenance to ensure efficient drilling operations. Bit Selection and Optimization: The choice of drill bits significantly impacts drilling performance. Students learn about different bit types, their applications, and factors influencing their selection. They also study techniques to optimize bit performance by considering factors such as formation hardness, cutting structure, hydraulics, and torque requirements. Wellbore Stability and Hole Cleaning: Maintaining wellbore stability and effective hole cleaning are essential for efficient drilling. Students learn about wellbore stability issues, including shale instability, differential sticking, and lost circulation. They explore strategies to mitigate these issues and optimize hole cleaning through proper drilling fluid properties, optimized drilling parameters, and suitable cleaning mechanisms. Directional Drilling Optimization: The course covers directional drilling techniques and their optimization strategies. Students learn about rotary steerable systems, measurement-while-drilling (MWD) tools, and logging-while-drilling (LWD) tools.

	They gain insights into wellbore positioning, wellbore quality control, and wellbore placement optimization for maximizing reservoir exposure. Drilling Data Analysis and Performance Improvement: Students are introduced to techniques for analyzing drilling data to identify areas of improvement. They learn how to interpret data related to rate of penetration (ROP), torque and drag, wellbore stability indicators, and drilling vibrations. By identifying patterns and trends, students can propose modifications to optimize drilling performance.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction drilling optimization • Overview the importance of drilling optimization in oil and gas industry . • Bit selection and evaluation based on cost per foot of drilled formations . • Using Break –even analysis for bit performance evaluation .
Week 2	Factors affecting rate of penetration • General review on factors effecting rate of penetration . • Introduction to Controllable and uncontrollable factors.
Week 3	Factors affecting rate of penetration according to Lummus' study • Effect of rock properties on rate of penetration . • Fundamentals of rock failure . • Effect of weight on bit (WOB) on rate of penetration. • Effect of rotary speed (RPM) on rate of penetration. • Effect of bit size and bit type on rate of penetration.
Week 4	Effect of drilling fluid properties on rate of Penetration • Effect of drilling fluid density on rate of penetration. • Effect of drilling fluid viscosity on rate of penetration. • Effect of drilling fluid filtration loss on rate of penetration.
Week 5	Effect of drilling fluid properties on rate of Penetration • Effect of drilling fluid solid content on rate of penetration. • Effect of drilling fluid oil content on rate of penetration. • Effect of drilling fluid chemical composition on rate of penetration. • Quiz
Week 6	Hydraulic Optimization • Hydraulics Fundamentals • Overview of pressure losses in circulation system. • Pressure losses calculations in circulation system.
Week 7	Hydraulic Optimization with limited surface Pressure • General form of Hydraulic optimization.

	• Using Maximum Hydraulic horsepower as optimization criterion . • Determining the turbulence index using Robinson method • Determining the optimum flow rate and the optimum pressure drop at the bit. • Selecting the optimum Nozzles size.
Week 8	Hydraulic Optimization with limited surface Pressure • Using Maximum Impact force as optimization criterion . • Determining the turbulence index using Robinson method • Determining the optimum flow rate and the optimum pressure drop at the bit. • Selecting the optimum Nozzles size.
Week 9	Hydraulic Optimization using the Modified Goins method • Discussing the effect of increasing mud density on hydraulics optimization • Discussing the effect of increasing surface pressure on hydraulics optimization • Determining the optimum flow rate and the optimum pressure drop at the bit using the modified Goins method.
Week 10	Expected value as optimization criterion • Introducing the concept of expected value. • Determining the optimum drill pipe size.
Week 11	Expected value as optimization criterion • Determining the optimum drill collar size. • Determining the optimum mud circulation time.
Week 12	Mathematical drilling Models • The concept of a Mathematical drilling model • Steps for Developing a mathematical drilling model. • Factors to be considered in Developing a mathematical drilling model. • Overview of drilling models used in oil industry.
Week 13	Mathematical drilling models for optimizing drilling parameters • Introducing the development of Galle-Woods mathematical drilling model • Application of Galle-Woods model for selecting the optimum (WOB, &RPM) • Application of Young- Bourgoyne drilling model for selecting the optimum (WOB, &RPM)
Week 14	Reviewing the recent advances in drilling optimization

	• The concept of real-time drilling optimization. • Field cases of drilling optimization
Week 15	Final Project and Exam Preparation Completion of a drilling optimization project. Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	- Applied drilling Engineering by Adam T. Bourgoyne - Drilling and well completions by Carl Gatlin	Yes
Recommended Texts	Advanced oil well drilling Engineering by Bill-J-Mitchell	yes

	- Applied Drilling Engineering Optimization. - Authors: G. Robello Samuel, Jamal J. Azar,	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Multi-Phase Flow Through Porous Media**	**Module Delivery**	
Module Type	**Core**	☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PE 423**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	4	**Semester of Delivery**	2
Administering Department	Type Dept. PE	**College**	Type College Code
Module Leader	Mohammed Abdul Ameer	**e-mail**	Dr.alhumairi@uomisan.edu.iq
Module Leader's Acad. Title	Asst. Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Production engineering + Reservoir engineering	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Oil Well Test Module is designed to provide students with an in-depth understanding of the principles and techniques involved in testing oil wells. The module covers various aspects of well testing, including planning, design, execution, and interpretation of tests. Students will learn about the equipment and methods used in well testing, as well as the analysis of data obtained from these tests. The module also emphasizes the importance of well testing in reservoir characterization, production optimization, and reservoir management.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The Well Test module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess reservoir potential, optimize well performance, and make informed decisions regarding production strategies. Well test analysis helps determine reservoir parameters, evaluate well productivity, identify formation damage, and validate reservoir models. The module also emphasizes the significance of data quality, accuracy, and integrity in well testing, ensuring reliable results for reservoir characterization and production forecasting.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered

Week 1	Introduction to Well Testing Overview of well testing objectives and applications Types of well tests: drill stem tests, production tests, interference tests Data acquisition and analysis
Week 2	Reservoir Properties and Wellbore Storage Reservoir properties affecting well test analysis Wellbore storage effects and correction methods
Week 3	Well Test Design and Planning Test objectives and design considerations Test types and duration Well test planning process
Week 4	Well Test Equipment Introduction to well test equipment Downhole tools, surface equipment, and measurement devices
Week 5	Well Test Execution Procedures for conducting well tests Safety precautions and operational considerations quiz
Week 6	Pressure Transient Analysis Pressure transient behavior and analysis techniques Pressure buildup and drawdown tests
Week 7	Well Test Interpretation - Analytical Methods Introduction to analytical well test interpretation Pressure derivative and type curve analysis
Week 8	Well Test Interpretation - Numerical Methods Introduction to numerical well test interpretation Finite difference and finite element methods
Week 9	Well Test Interpretation - Unconventional Reservoirs Well test analysis in unconventional reservoirs Challenges and considerations

Week 10	Multi -rate and Multilayer Well Test Analysis Analysis techniques for multi-rate and multilayer reservoirs Interpretation challenges and solutions. Quiz.
Week 11	Well Test Analysis in Fractured Reservoirs Well test analysis in fractured reservoirs Dual porosity and dual permeability models
Week 12	Well Test Analysis in Naturally Fractured Reservoirs Well test analysis in naturally fractured reservoirs Fracture matrix interaction models
Week 13	Well Test Analysis in Gas Reservoirs Analysis techniques for gas reservoirs Deliverability and deliverability testing. Report Due.
Week 14	Well Test Analysis Case Studies Review and analysis of real-world well test data Interpretation challenges and solutions
Week 15	Final Project and Exam Preparation Completion of a well test project Exam preparation and review
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Agilent VEE and PSPICE
Week 2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws

Week 3	Lab 3: First-Order Transient Responses
Week 4	Lab 4: Second-Order Transient Responses
Week 5	Lab 5: Frequency Response of RC Circuits
Week 6	Lab 6: Frequency Response of RLC Circuits
Week 7	Lab 7: Filters

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Natural Gas Engineering**	**Module Delivery**	
Module Type	**C**	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PE 351**		
ECTS Credits	5		
SWL (hr/sem)	**125**		
Module Level		**Semester of Delivery**	2
Administering Department	Type Dept. PE	**College**	Type College Code
Module Leader	Mudhaffar Yacoub Hussein	**e-mail**	myhussein2017@uomisan.edu.iq
Module Leader's Acad. Title	Asst. Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	1/10/2024	**Version Number**	1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Production engineering	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The objectives of the "Natural Gas Engineering" course are as follows: 1. Introduction: Understand the concept of natural gas reservoirs, utilization of natural gas, the natural gas industry, and types of natural gas resources. 2. Properties of Natural Gas: Comprehend the fundamental properties of natural gas, including density, viscosity, thermal characterization, and heating value. 3. Natural Gas Composition and Phase Behavior: Explain the chemical composition of natural gas and the impact of pressure and temperature conditions on phase behavior. 4. Natural Gas Exploration, Drilling, and Well Completion: Clarify the processes involved in natural gas exploration, drilling operations, and well completion to ensure effective gas production. 5. Natural Gas Production: Study the flow of gas in porous and non-porous media, as well as methods for estimating gas well deliverability.

	6. Natural Gas Processing: Examine the separation of gas and liquids, dehydration techniques, and the removal of impurities from natural gas. 7. Natural Gas Sweetening and Acid Gases Removal: Investigate the purification processes for natural gas, including the removal of acid gases and harmful substances. 8. Natural Gas Transportation: Explore pipeline systems for transporting natural gas, as well as the use of compressed natural gas and liquefied natural gas (LNG) in transportation. 9. Natural Gas Supply, Alternative Energy Sources, and the Environment: Evaluate the environmental impact of natural gas industry activities, explore alternative energy sources, and study the concepts of environmental sustainability in the energy sector. In summary, the "Natural Gas Engineering" course aims to provide students with a comprehensive understanding of natural gas, its industry, extraction and processing operations, transportation methods, and the environmental implications. Additionally, the course covers the exploration of alternative energy sources and emphasizes environmental sustainability in the energy sector.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Introduction: - Define natural gas reservoir and its concept. - Explain the utilization of natural gas. - Describe the natural gas industry. - Identify types of natural gas resources. 2. Properties of Natural Gas: - Analyze the physical and chemical properties of natural gas.

- Understand the phase behavior of natural gas.

3. Natural Gas Exploration, Drilling, and Well Completion:

- Explore the processes involved in natural gas exploration.

- Understand drilling techniques and well completion.

4. Natural Gas Production:

- Analyze the flow of gas in porous media using Darcy and non-Darcy flow equations.

- Evaluate the deliverability of natural gas wells.

5. Natural Gas Processing:

- Explain the separation of gas and liquids in the processing of natural gas.

- Understand the dehydration process for natural gas.

- Describe the removal of acid gases and sweetening of natural gas.

6. Natural Gas Transportation:

- Explain the transportation methods for natural gas, including pipelines and compressed natural gas (CNG).

- Understand the liquefaction process of natural gas to produce liquefied natural gas (LNG).

7. Natural Gas Supply, Alternative Energy Sources, and the Environment:

- Assess the availability of natural gas as a fuel source.

- Explore alternative energy sources to natural gas.

- Understand the environmental impact of natural gas and environmental considerations.

These learning outcomes aim to provide a comprehensive understanding of the nature of natural gas and its uses, as well as the processes involved

	in exploration, production, processing, transportation, and the impact on the environment..
Indicative Contents المحتويات الإرشادية	- Introduction: This section covers the concept of a natural gas reservoir, including its definition and components. It also discusses the various uses of natural gas, different types of natural gas resources, and the significance of the natural gas industry. - Properties of Natural Gas: This section explains the physical and chemical properties of natural gas, such as density, viscosity, and explosive characteristics, and how these properties impact the utilization of natural gas in various industries. - Natural Gas Composition and Phase Behavior: This section delves into the composition of natural gas and its phase behavior, including changes in phases and the necessary conditions for natural gas formation. - Natural Gas Exploration, Drilling, and Well Completion: This section provides an overview of the process of natural gas exploration, drilling techniques, and well completion procedures, including modern exploration technologies and efficient drilling methods. - Natural Gas Production: This section focuses on the flow of gas in porous media, discussing Darcy flow and non-Darcy flow, as well as the productive capacity of natural gas wells. - Natural Gas Processing: This section covers the post-extraction processing of natural gas, including the separation of gas and liquids, dehydration techniques, and the removal of acid gases. - Natural Gas Transportation: This section discusses the transportation methods for natural gas, including pipelines

	and compressed natural gas. It also introduces liquefied natural gas (LNG) as an alternative transportation method. - Natural Gas Supply, Alternative Energy Sources, and the Environment: This section explores natural gas supply, alternative energy sources, and the environmental considerations associated with natural gas production and consumption.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Provide a comprehensive introduction: Begin by giving a comprehensive introduction to the concept of a natural gas reservoir, the utilization of natural gas, the natural gas industry, and the types of natural gas resources. 2. Focus on the properties of natural gas: Explain the properties of natural gas such as density, viscosity, flammability, and heating values. 3. Explain natural gas composition and phase behavior: Discuss the composition of natural gas and explain its phase behavior under different conditions, such as pressure and temperature. 4. Emphasize natural gas exploration, drilling, and well completion: Explain the process of natural gas exploration, drilling, and well completion, along with various exploration techniques. 5. Illustrate natural gas production: Explain the flow of natural gas in porous media using Darcy and non-Darcy models, and provide details on natural gas well deliverability. 6. Describe natural gas processing: Clarify the process of separating gas and liquids, dehydration, and the purification of natural gas by removing acid gases. 7. Focus on natural gas transportation: Explain natural gas transportation systems

	through pipelines and compressed natural gas, as well as the liquefied natural gas (LNG) system. 8. Discuss natural gas supply, alternative energy sources, and the environment: Engage in discussions regarding natural gas supply, alternative energy sources, and the environmental impact of natural gas utilization. These strategies aim to provide a comprehensive understanding of natural gas engineering by incorporating theoretical explanations, practical examples, case studies, and discussions on relevant topics.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
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Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction: What is Natural gas Reservoir Utilization of natural gas
Week 2	Natural gas industry Natural gas resources.
Week 3	Properties of natural gas.
Week 4	Properties of natural gas.
Week 5	Natural gas composition and phase behavior Quiz
Week 6	Natural gas exploration , Drilling and well completion
Week 7	Midterm Exam
Week 8	Natural gas well deliverability
Week 9	Natural gas production: Darcy and Non-Darcy flow in porous media
Week 10	Natural gas deliverability. Quiz.
Week 11	Natural Gas Processing: Separation of gas liquids, Dehydration
Week 12	Natural gas Sweeting-Acid gases removal testing.
Week 13	Natural gas transportation: pipelines and compressed natural gas..

Week 14	Liquefied natural gas (LNG).
Week 15	Natural gas supply, Alternative energy source, and the environment. Exam preparation and review
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Xiuli Wang and Michael Economides, Advanced Natural Gas Engineering, Copyright © 2009 by Gulf Publishing Company, Houston, Texas. n	No
Recommended Texts	H. Dale Beggs-Gas Production Operations -Oil & Gas Consultants International (2002)..	No

Websites	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="6">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2">Reservoir Simulation and Applied Numerical Methods</td><td colspan="3">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">Core</td><td colspan="3" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">PE 425</td></tr>
<tr><td>ECTS Credits</td><td colspan="2">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2">150</td></tr>
<tr><td colspan="2">Module Level</td><td></td><td colspan="2">Semester of Delivery</td><td>1</td></tr>
<tr><td colspan="2">Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="2">Type College Code</td></tr>
<tr><td>Module Leader</td><td colspan="2">Hasan Hussein</td><td>e-mail</td><td colspan="2">Dr.hassan@uomisan.edu.iq</td></tr>
<tr><td colspan="2">Module Leader's Acad. Title</td><td></td><td colspan="2">Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td colspan="2">Name (if available)</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="2">E-mail</td></tr>
<tr><td colspan="2">Scientific Committee Approval Date</td><td>1/10/2024</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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<table>
<tr><td colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Reservoir Engineering- Reservoir Geology- Production</td><td>Semester</td><td></td></tr>
</table>

	Engineering- Drilling Engineering		
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The Reservoir Simulation Module is designed to provide students with general understanding of the principles and basic equations involved in reservoir simulation, the numerical principles of finite difference, the data requirements for conducting a reservoir simulation study, the current simulation study approaches, the simulation Steps. The module involves modeling a synthetic reservoir model using a well-known reservoir simulation software. Students will run and analyze many reservoir models.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The Reservoir simulation module is crucial for petroleum engineers as it equips them with the knowledge and skills to assess dynamic reservoir models, Solve the governing partial differential equations using finite difference methods, Use a reservoir simulator for studying the reservoir performance in response to different development strategies, Develop static and dynamic model of the reservoir.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم و التعليم	
Strategies	The main strategy that will be adopted in delivering this module is by explaining the theoretical aspects of the reservoir simulation course with all the related mathematical concepts and the numerical analysis, while at the same time the students will be divided into research groups to build reservoir simulation models, run the dynamic models, encourage students to analysis the results and the reservoir limitation, deliver two reports for the models that they ran. Building numerical

	models as group of students would encourage them to develop a critical thinking and expand their understanding via working in groups, as they would discuss their models as peers. Also they would discuss the models with their teachers. Then, students would deliver presentations for these reports where they will be discussed about their analyses of the reservoir models.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Reservoir simulation • What is a simulation model? • A simple example of a simulation model • What is a reservoir simulation model? • The task of reservoir simulation • What are we trying to do and how complex must our model be?
Week 2	Field Applications of Reservoir Simulation • Discussion of Changes in Reservoir Simulation; 1970s – 2000 • The Treatment of Uncertainty in Reservoir Simulation • Study example of a reservoir simulation • Types of reservoir simulation model
Week 3	Reservoir Simulation Model Set-Up • Setting up a reservoir simulation model • Data input and output • Example input data file • Reservoir System to be Modelled • ECLIPSE Syntax • Model Dimensions
Week 4	Reservoir Simulation Model Set-Up: II • Grid and Rock Properties • Fluid Properties • Initial Conditions • Output Requirements • Production Schedule • Running eclipse and file name • Conventions • Running ECLIPSE on a PC • File Name Conventions
Week 5	Gridding And Well Modelling: Gridding • Introduction • Gridding in Reservoir Simulation ➢ Accuracy of Simulations and Numerical Dispersion

	➢ Grid Orientation Effects ➢ Local Grid Refinement (LGR) ➢ Distorted Grids and Corner Point Geometry ➢ Issues in Choosing a Reservoir Simulation Grid Streamline Simulation
Week 6	Gridding And Well Modelling: Block to block flow calculations • The calculation of block to block flows in reservoir simulators ➢ Introduction to Averaging of Block to Block Flows ➢ Averaging of the Two-Phase Mobility Term
Week 7	Gridding And Well Modelling: Wells in Reservoir Simulation • Basic Idea of a Well Model • Well Models for Single and Two-Phase Flow • Well Modelling in a Multi-Layer System • Modelling Horizontal Wells
Week 8	The Flow Equations: single phase • The single phase pressure equation • Extension of Single Phase Pressure Equation to 2D & 3D
Week 9	The Flow Equations: two phase flow • The two-phase flow equations • Review of Two-Phase Flow Concepts • Derivation of the Two-Phase Conservation Equations. • The Two-Phase Pressure Equation Simplified Two-Phase Pressure and Saturation Equations
Week 10	Numerical Methods in Reservoir Simulation • Introduction • Review of finite differences • Application of finite differences to partial differential equations (PDEs) • Forward, Backward, and Central Difference Formulas for the First Derivative • Finite Difference Formulas Using Taylor Series Expansion ➢ Finite Difference Formulas of First Derivative ➢ Two-point forward difference formula for first derivative ➢ Two-point central difference formula for first derivative • Finite Difference Formulas for the Second Derivative
Week 11	Numerical Methods: Explicit and Implicit Finite Difference Approximation • Explicit Finite Difference Approximation of the Linear Pressure Equation • Implicit Finite Difference Approximation of the Linear Pressure Equation
Week 12	Numerical Methods: Implicit Finite Difference in 2D models • Implicit Finite Difference Approximation of the 2D Pressure Equation • Discretisation of the 2D Pressure Equation • Numbering Schemes in Solving the 2D Pressure Equation • Implicit Finite Difference Approximation of Non-linear Pressure Equations

	• Application of finite differences to two-phase flow • Discretisation of the Two-Phase Pressure and Saturation Equations • IMPES Strategy for Solving the Two-Phase • Pressure and Saturation Equations
Week 13	Numerical Methods: Matrix principles • Definitions of matrices • Determinant of Matrix • Cofactor of matrix • Transpose of Matrix • Adjugate and Inverse of Matrix • Matrix for finite difference
Week 14	Numerical Methods: Matrix solutions • Solving systems of linear equations • Direct Methods: Gaussian Elimination and Gauss Jorden • Iterative Methods: Jacobi iteration and Gauss Seidel • Thomas Algorithm • Solving Implicit finite difference problems
Week 15	Final Project and Exam Preparation • Completion of Reservoir Simulation reports • Exam preparation and review
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to Eclipse; pre-and post-processing software Introduce Eclipse data file for a case study model
Week 2	Lab 2: Modifying the data file model to change the wells control mode and the model running time -how this would change the differential pressure across the reservoir as the water saturation throughout the reservoir increases
Week 3	Lab 3: investigating the effect of permeability variation in layered model
Week 4	Lab 4: Sensitivity analysis on flow behavior for two phase models

Week 5	Lab 5: effect of gravity and capillary pressure in layered models
Week 6	Lab 6: vertical connectivity effect
Week 7	Lab 7: grid coarsening and refining effect
Week 8	Lab 8: improve sweeping efficiency by polymer flooding
Week 9	Lab9: introduction to numerical coding: python code
Week 10	Lab10: coding forward, backward and central finite difference
Week 11	Lab11: coding explicit finite difference of single phase pressure equation
Week 12	Lab12: coding implicit finite difference of single phase pressure equation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group **(50 - 100)**	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><th colspan="6">Module Information
معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="3">Engineering Project</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="3">Basic</td><td colspan="2" rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="3">PE 426</td></tr>
<tr><td>ECTS Credits</td><td colspan="3">4</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="3">100</td></tr>
<tr><td>Module Level</td><td>4</td><td colspan="2">Semester of Delivery</td><td colspan="2">1 and 2</td></tr>
<tr><td>Administering Department</td><td>Type Dept. PE</td><td>College</td><td colspan="3">Type College Code</td></tr>
<tr><td>Module Leader</td><td></td><td>e-mail</td><td colspan="3"></td></tr>
<tr><td>Module Leader’s Acad. Title</td><td>Asst. Professor</td><td colspan="2">Module Leader’s Qualification</td><td colspan="2">Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Name (if available)</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Peer Reviewer Name</td><td>Name</td><td>e-mail</td><td colspan="3">E-mail</td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/10/2024</td><td colspan="2">Version Number</td><td colspan="2">1.0</td></tr>
</table>

<table>
<tr><th colspan="4">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td></td><td>Semester</td><td></td></tr>
</table>

Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	8. Practical Application: The course aims to provide students with an opportunity to apply the theoretical knowledge they have acquired throughout their studies to a real-world engineering project. This includes understanding the practical aspects of petroleum engineering and the challenges involved in implementing engineering solutions. 9. Project Management Skills: The course aims to develop students' project management skills by guiding them through the different stages of an engineering project. This includes planning, organizing, and executing a project within specified constraints such as time, budget, and resources. 10. Interdisciplinary Collaboration: The course aims to promote interdisciplinary collaboration by encouraging students to work in teams with members from different engineering disciplines. Petroleum engineering projects often require collaboration with geologists, mechanical engineers, environmental engineers, and other specialists. The course aims to enhance students' ability to work effectively in a multidisciplinary team. 11. Problem-Solving and Critical Thinking: The course aims to enhance students' problem-solving and critical thinking skills. Engineering projects often involve complex problems that require creative and analytical thinking to identify and evaluate potential solutions. The course aims to provide students with opportunities to develop these skills through project-based learning. 12. Communication and Presentation Skills: The course aims to improve students' communication and presentation skills, as these are essential for effectively conveying technical information to stakeholders. Students may be required to present their project findings, results, and recommendations in written reports, oral presentations, or other forms of communication. 13. Ethical and Professional Responsibilities: The course aims to raise students' awareness of the ethical and professional responsibilities associated with engineering projects. This includes considerations such as safety, environmental impact, and adherence to relevant codes of conduct. The course aims to foster a sense of professional integrity and accountability in students. 14. Industry Relevance: The course aims to align with industry standards and practices, providing students with insights into current trends and challenges in the petroleum engineering field. This may involve incorporating case studies, guest lectures, or industry visits to provide students with exposure to real-world engineering projects and professional practices.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	In the fourth-class petroleum engineering project course, students can expect to achieve the following module learning outcomes: 9- Project Planning and Management: Students will learn how to effectively plan and manage engineering projects in the petroleum industry. This includes developing project schedules, allocating resources, and understanding the project life cycle. 10- Technical Analysis and Problem Solving: Students will develop advanced skills in technical analysis and problem-solving specific to petroleum engineering projects. They will learn to identify and address engineering challenges, evaluate different solutions, and make informed decisions. 11- Engineering Design and Optimization: Students will gain knowledge and practical experience in designing and optimizing engineering systems and processes within the petroleum industry. They will learn to apply engineering principles, use software tools, and consider factors such as safety, cost-effectiveness, and environmental impact. 12- Data Analysis and Interpretation: Students will acquire the skills to collect, analyze, and interpret data relevant to petroleum engineering projects. They will learn to use statistical techniques and software tools to draw meaningful conclusions and make data-driven decisions. 13- Technical Communication and Presentation: Students will develop effective communication skills, both written and oral, necessary for presenting engineering projects. They will learn to prepare technical reports, project proposals, and deliver presentations to convey complex engineering concepts and findings to diverse audiences. 14- Collaboration and Teamwork: Students will learn to work collaboratively in multidisciplinary teams, simulating real-world project environments. They will develop skills in team dynamics, effective communication, and conflict resolution to achieve project goals collectively. 15- Ethical and Professional Practices: Students will gain an understanding of ethical and professional practices relevant to the petroleum engineering field. They will learn about professional codes of conduct, legal considerations, and ethical decision-making in engineering project management. 16- Industry Awareness: Students will develop knowledge and awareness of current trends, challenges, and technological advancements in the petroleum industry. They will explore case studies, industry best practices, and emerging technologies relevant to petroleum engineering projects.
Indicative Contents المحتويات الإرشادية	1- Project Selection: Students are typically required to identify a specific petroleum engineering project or problem that they will work on throughout the course. This could involve topics such as reservoir characterization, well design, production optimization, or environmental impact assessment. 2- Literature Review: Students conduct a comprehensive review of existing

	literature and relevant research in their chosen project area. This helps them gain a deeper understanding of the problem and the current state-of-the-art practices and technologies in the field. 3- Project Planning: Students develop a detailed project plan that outlines the objectives, methodology, timeline, and available resources for their project. They also identify potential risks and mitigation strategies. 4- Data Collection and Analysis: Depending on the nature of the project, students may be required to collect relevant data from various sources such as field measurements, laboratory experiments, or existing datasets. They analyze the data using appropriate statistical and engineering analysis techniques. 5- Design and Simulation: If the project involves designing a system or optimizing a process, students use specialized software tools and simulations to develop and evaluate different engineering solutions. This could include reservoir modeling, wellbore design, production forecasting, or facility layout optimization. 6- Technical Documentation: Students are expected to maintain detailed records of their work and produce technical reports or presentations that document their project findings, methodologies, and recommendations. This involves effective communication of technical information and graphical representation of data. 7- Project Evaluation: Towards the end of the course, students present their project work to a panel of faculty members and industry professionals who evaluate the quality of their research, analysis, and conclusions. This may include a formal presentation, demonstration of software tools, and answering questions related to the project. 8- Collaboration and Teamwork: In some cases, students may work on group projects, simulating real-world engineering teams. This encourages collaboration, division of tasks, and effective communication within the team.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The engineering project course for fourth-class students in the petroleum engineering department typically focuses on providing students with practical experience in planning, designing, and executing engineering projects related to the petroleum industry. Here are some strategies that could be employed in such a course:

10. Project Selection: Encourage students to select projects that align with their interests and are relevant to the petroleum engineering field. This could involve exploring various topics such as reservoir engineering, drilling operations, production optimization, or petrochemical processes.
11. Project Planning: Teach students how to develop a comprehensive project plan, including defining project objectives, identifying deliverables, creating a work breakdown structure, and establishing a realistic timeline. Emphasize the importance of setting achievable goals and managing project scope effectively.
12. Research and Analysis: Guide students in conducting thorough research on their chosen project topics. This may involve literature reviews, data collection, and analysis of existing technologies, methodologies, or case studies relevant to the project. Encourage critical thinking and problem-solving skills during this phase.
13. Design and Engineering: Instruct students on the principles of engineering design, including conceptualization, feasibility assessment, and detailed design. Provide guidance on utilizing software tools and simulation techniques commonly used in petroleum engineering, such as reservoir modeling software or drilling simulation software.
14. Collaboration and Teamwork: Emphasize the importance of teamwork and collaboration throughout the project. Assign students to work in teams, allowing them to benefit from diverse perspectives and develop skills in communication, coordination, and conflict resolution. Encourage regular team meetings and progress updates.
15. Implementation and Execution: Provide students with hands-on experience in executing their project plans. This may involve conducting experiments, simulations, or fieldwork, depending on the nature of the project. Encourage students to document their activities, record observations, and analyze results accurately.
16. Risk Management: Teach students to identify and assess potential risks associated with their projects. Emphasize the importance of implementing mitigation measures and contingency plans to minimize or address any unforeseen challenges that may arise during the project's execution.
17. Documentation and Reporting: Guide students in documenting their project activities and outcomes effectively. This may include writing technical reports, creating presentations, and delivering project summaries. Emphasize the importance of clear and concise communication skills in conveying project information.
18. Evaluation and Reflection: Conduct regular evaluations to assess students' progress and provide constructive feedback on their performance. Encourage students to reflect on their learning experiences and identify areas for improvement.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Engineering Projects
Week 2	Project Planning and Initiation
Week 3	Project Organization and Team Formation
Week 4	Project Risk Management
Week 5	Project Scheduling and Resource Management
Week 6	Project Cost Estimation and Budgeting
Week 7	Project Quality Management
Week 8	Project Execution and Monitoring
Week 9	Project Communication and Reporting
Week 10	Project Integration and Scope Management
Week 11	Finalizing project reports and handover procedures
Week 12	Project Case Studies and Presentations: Analyzing and discussing real-world engineering project case studies
Week 13	Project Case Studies and Presentations: Presenting individual or group projects to the class
Week 14	Project Case Studies and Presentations:

	Q&A sessions and feedback on project presentations
Week 15	Project Case Studies and final Presentations:
Week 16	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم و التدريس		
	Text	**Available in the Library?**
Required Texts	1- A Hamdy, Operations Research an introduction, Edition, Pearson Prentice Hall, 8th, 2007.	Yes
Recommended Texts	2. Introduction to Operations Research, Seventh Edition/ F.S. Hillier/G. J. Lieberman, Mc Graw-Hill.	No
Websites		

<table>
<tr><th colspan="5">Grading Scheme
مخطط الدرجات</th></tr>
<tr><th>Group</th><th>Grade</th><th>التقدير</th><th>Marks (%)</th><th>Definition</th></tr>
<tr><td rowspan="5">Success Group
(50 - 100)</td><td>A - Excellent</td><td>امتياز</td><td>90 - 100</td><td>Outstanding Performance</td></tr>
<tr><td>B - Very Good</td><td>جيد جدا</td><td>80 - 89</td><td>Above average with some errors</td></tr>
<tr><td>C - Good</td><td>جيد</td><td>70 - 79</td><td>Sound work with notable errors</td></tr>
<tr><td>D - Satisfactory</td><td>متوسط</td><td>60 - 69</td><td>Fair but with major shortcomings</td></tr>
<tr><td>E - Sufficient</td><td>مقبول</td><td>50 - 59</td><td>Work meets minimum criteria</td></tr>
<tr><td rowspan="2">Fail Group
(0 – 49)</td><td>FX – Fail</td><td>راسب (قيد المعالجة)</td><td>(45-49)</td><td>More work required but credit awarded</td></tr>
<tr><td>F – Fail</td><td>راسب</td><td>(0-44)</td><td>Considerable amount of work required</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">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.</td></tr>
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