Ministry of Higher Education and Scientific Research
University of Mosul
College of Petroleum and Mining Engineering
Department of Petroleum Reservoir Engineering

Course descriptions
Petroleum Resivoir Engineering
2023-2024

Course descriptions
First Level (Bologna Process)
2023-2024

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2"><strong style="color:red">Engineering Mechanics I (Statics)</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2" align="center">S</td><td rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2" align="center"><strong style="color:red">PRE 112</td></tr>
<tr><td>ECTS Credits</td><td colspan="2" align="center">6</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2" align="center"><strong style="color:red">150</td></tr>
<tr><td>Module Level</td><td>UGI</td><td>Semester of Delivery</td><td>One</td></tr>
<tr><td>Administering Department</td><td>PRE</td><td>College</td><td>PMEUOM</td></tr>
<tr><td>Module Leader</td><td>Ayad M. Ahmed Alwaise</td><td>e-mail</td><td>Ayad_waise@yahoo.com</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: Sarah Saad Abduljabbar</td><td>e-mail</td><td>sarahsaad3860707@uomosul.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>01/06/2023</td><td>Version Number</td><td>1.0</td></tr>
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<table>
<tr><td colspan="3" align="center">Relation with other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td></tr>
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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 statics and applications physics theory through the application of techniques. 2. To understand forces, Moments and equilibrium system. 3. This course deals with the basic concept of Mechanical Engineering. 4. This is the basic subject for all statics and forces applications. 5. To understand concept of moment and forces problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Gain a foundational understanding of the fundamental physical and mathematical principles underlying mechanics. 2. Apply analytical techniques to analyze and calculate resultant forces acting on bodies in equilibrium. 3. Differentiate vector operations for normal forces, resultant moments, and couples 4. Identify and interpret forces acting on bodies using the free-body diagram approach for problem-solving.. 5. Analyze equilibrium systems involving frictional forces. 6. Determine the centroid of composite bodies and calculate the moment of inertia for a given body and specified axes
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Newton's Theory Statics is a type of science that helps people design safe and strong structures, like bridges and buildings. It's all about studying how things stay in place even when they are not moving. This is important for engineers and physicists who want to understand how materials react to different forces, like the ones that happen when an airplane takes off or lands. By studying statics, people can make better things and improve technology. [15 hrs.] Statics is a branch of mechanics that deals with the study of stationary objects and systems under the action of external forces. In other words, statics is concerned with the analysis of forces acting on objects that are not in motion. It is an essential subject for engineers and physicists as it is the foundation for the study of mechanics, which is the branch of physics that deals with the motion of objects. Statics is a crucial sub-topic of mechanics and is essential in engineering and physics courses. [15 hrs.] It deals with the study of forces acting on objects that are not moving. The primary objectives of statics are to determine the forces acting on an object, the moments of forces acting on an object, and the equilibrium conditions of an object. The study of statics is essential for the design of structures, such as bridges, buildings, and machines, to ensure that they are safe and reliable. [10 hrs.] Revision problem classes [6 hrs.] The study of statics is also important in understanding the behavior of materials under different conditions. It helps engineers and physicists to understand how different materials react to external forces and how they can be designed to withstand these

	forces. For example, in aerospace engineering, the study of statics is essential in the design of aircraft and spacecraft to ensure that they can withstand the forces of takeoff, landing, and flight. In general, the study of statics is crucial for the development of new technologies and the improvement of existing ones. [15 hrs.]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The objective of this course is to enhance the ability of first-year students to predict and evaluate the impacts of forces, moments, couples, and distributed loads on bodies. The main approach employed in this course is to foster student engagement through active participation in discussions and problem-solving exercises. By doing so, students are encouraged to develop and refine their critical thinking skills, enabling them to analyze and understand the influence of applied forces on bodies. This approach is facilitated through classroom lectures, interactive tutorials, and the inclusion of real-life applications that capture students' interest and attention

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	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
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 and 10	LO #1, #2 and #3
	Assignments	3	10% (10)	4,6 and 12	LO # 2,3, 4,5, and ,6
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #4, #5 and #6
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (60)	16	All
Total assessment		100% (100 Marks)			

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to engineering mechanics
Week 2	Newton's Second Law
Week 3	Forces and Resultant
Week 4	Forces and Resultant
Week 5	Moment
Week 6	Moment
Week 7	Moment of Couple
Week 8	Free body diagram
Week 9	Equilibrium
Week 10	Equilibrium
Week 11	Centroid
Week 12	Centroid
Week 13	Moment of Inertia
Week 14	Moment of Inertia
Week 15	Frictions
Week 16	**Preparatory week before the final Exam**

<table>
<tr><td colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Hibbeler, RC, "Engineering Mechanics Statics", 13th edition, 2013.</td><td>Yes</td></tr>
<tr><td>Recommended Texts</td><td>Meriam, James L., and L. Glenn Kraige, "Engineering mechanics: statics", John Wiley & Sons, 2012.</td><td>No</td></tr>
<tr><td>Websites</td><td></td><td></td></tr>
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<table>
<tr><td colspan="5">Grading Scheme
مخطط الدرجات</td></tr>
<tr><td>Group</td><td>Grade</td><td>التقدير</td><td>Marks %</td><td>Definition</td></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>
</table>

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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نموذج وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center">Mathematics 1</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">Basic learning activities</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center">PRE 113</td></tr>
<tr><td>ECTS Credits</td><td align="center">6.00</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center">150</td></tr>
<tr><td align="center">Module Level</td><td align="center">UGI</td><td>Semester of Delivery</td><td align="center">1</td></tr>
<tr><td>Administering Department</td><td align="center">PRE</td><td>College</td><td>PMEUOM</td></tr>
<tr><td>Module Leader</td><td align="center">Ziadoon M.Khaleel</td><td>e-mail</td><td>ziadoon.khaleel@uomosul.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td align="center">Assistant Lecturer</td><td>Module Leader's Qualification</td><td align="center">MSc.</td></tr>
<tr><td>Module Tutor</td><td align="center">UGI</td><td>e-mail</td><td></td></tr>
<tr><td>Peer Reviewer Name</td><td></td><td>e-mail</td><td></td></tr>
<tr><td>Scientific Committee Approval Date</td><td align="center">1/6/2023</td><td>Version Number</td><td>1.0</td></tr>
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<tr><td colspan="4" align="center">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>Mathematic II</td><td>Semester</td><td>Tow</td></tr>
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Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Apply mathematical principles and concepts to solve engineering problems. 2. Develop proficiency in mathematical modeling and analysis for engineering systems. 3. Use mathematical tools and techniques to optimize engineering designs and processes. 4. Foster critical thinking and problem-solving skills in an engineering context. 5. Enhance understanding of advanced mathematical topics relevant to engineering disciplines. 6. Bridge theoretical knowledge of mathematics with practical engineering applications. 7. Develop a strong foundation in mathematical techniques used in specific engineering disciplines. 8. Enhance quantitative reasoning skills for making informed engineering decisions. 9. Foster an appreciation for the role of mathematics in engineering and its significance in solving real-world problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understand the transcendental functions, which include exponential, logarithmic, and trigonometric functions. the properties of exponential functions, such as exponential growth/decay, transformations, and applications. Learn about logarithmic functions, their properties, and their applications. 2- Explore trigonometric functions, including sin, cosin, and tangent, and understand their periodicity, graphs, and key properties. 3- studying of techniques integration, will help to Apply the fundamental theorem of calculus to evaluate definite and indefinite integrals.Utilize integration by substitution, integration by parts, and partial fractions to simplify integrals. 4- studying double and triple integrals, will be able Understand the concept of double and triple integrals as extensions of single-variable integration. 5- Demonstrate the ability to integrate knowledge and ideas of Partial Derivatives: By studying partial derivatives, the student will be able to Compute partial derivatives of functions of multiple variables. 6- Understand and apply the chain rule for functions of several variables Calculate directional derivatives and gradients. Understand and apply the concept of tangent planes and linear approximations. and Solve optimization problems using partial derivatives. 7- Understand the definition and basic concepts of differential equations. and Solve first&second -order differential equations using various methods. 8- Apply differential equations to real-life applications in various fields.

	Indicative content includes the following.
Indicative Contents المحتويات الإرشادية	**Part A – Mathematic Theory** Functions and Limits: Definition and properties of functions , Domain, range, and graphing of functions [2 hrs], Limits and continuity of functions , Evaluating limits algebraically and graphically[2 hrs]. Differentiation: Definition and interpretation of derivatives, Basic rules of differentiation: power rule[2 hrs], product rule, quotient rule [2 hrs], and chain rule. Implicit differentiation and related rates [2 hrs] , Applications of derivatives: optimization, curve sketching, and linear approximation[2 hrs]. Applications of Differentiation: Maxima and minima: finding local and global extrema [2 hrs], Concavity and inflection points[2 hrs] , Curve sketching: determining the behavior of a function using derivatives[2 hrs] Integration: finite and indefinite integrals [2 hrs], Definite integrals and their interpretation as areas[2 hrs] ,Techniques of integration: substitution[2 hrs], integration by parts, trigonometric substitutions[2 hrs]. Applications of integration: area between curves[2 hrs], volume of solids of revolution[2 hrs]. **[30 hrs]** **Part B – Tutorial** Functions and Limits: Domain, range, graphing of functions [2 hrs], Limits and continuity of functions [2hrs], Evaluating limits algebraically and graphically[2 hrs]. Differentiation: chain rule[2 hrs]. Implicit differentiation and related rates [2 hrs] , Applications of derivatives: optimization [2hrs], curve sketching[2 hrs], and linear approximation[2 hrs]. Applications of Differentiation: local and global extrema [2 hrs]. Integration: finite and indefinite integrals [2 hrs], Definite integrals and their interpretation as areas[2 hrs] , substitution[2 hrs], integration by parts [2 hrs], trigonometric substitutions[2 hrs]. Applications of integration: area between curves, volume of solids of revolution[2 hrs]. **[30 hrs]** **Part c – Online** Functions and Limits: Definition and properties of functions , Domain, range, and graphing of functions [1 hrs], Limits and continuity of functions , Evaluating limits algebraically and graphically[1 hrs].

	Differentiation:
	Definition and interpretation of derivatives, Basic rules of differentiation: power rule[1 hrs], product rule, quotient rule [1 hrs], and chain rule. Implicit differentiation and related rates [1 hrs] , Applications of derivatives: optimization, curve sketching, and linear approximation[1 hrs].
	Applications of Differentiation:
	Maxima and minima: finding local and global extrema [1 hrs], Concavity and inflection points[1 hrs] , Curve sketching: determining the behavior of a function using derivatives[1 hrs]
	Integration:
	finite and indefinite integrals [1 hrs], Definite integrals and their interpretation as areas[1 hrs] ,Techniques of integration: substitution[1 hrs], integration by parts, trigonometric substitutions[1 hrs]. Applications of integration: area between curves[1 hrs], volume of solids of revolution[1 hrs].
	[15 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

	Active Learning:
	Encourage students to actively engage with the material through problem-solving, discussions, and interactive activities. Provide opportunities for students to work on problems individually and in groups, promoting critical thinking and understanding of concepts
	Conceptual Understanding:
	Emphasize the underlying concepts and principles of calculus rather than focusing solely on procedures and calculations. Use real-world examples and applications to illustrate the relevance of calculus concepts.
	Problem-Solving Approach:
	Encourage students to approach problem-solving strategically, emphasizing the importance of planning, organizing, and reasoning through each step.
	Use of Resources:
Strategies	Utilize the textbook as a primary resource, complementing it with supplementary materials, including online resources, video tutorials, and practice exercises.
	Assessment and Feedback:
	Use a variety of assessment methods, including quizzes, tests, projects, and problem sets, to evaluate students' understanding of calculus concepts. Provide timely and constructive feedback on students' work, highlighting areas of strength and areas for improvement.
	Collaboration and Discussion:
	Foster a collaborative learning environment by encouraging students to work together, discuss concepts, and explain ideas to their peers. Incorporate group activities, such as problem-solving sessions, group projects, and presentations, to promote teamwork and peer learning.

<table>
<tr><td colspan="4">Student Workload (SWL)</td></tr>
<tr><td colspan="4">الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td></tr>
<tr><td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل</td><td>78</td><td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td><td>5</td></tr>
<tr><td>Unstructured SWL (h/sem)
الحمل الدراسي غير المنتظم للطالب خلال الفصل</td><td>72</td><td>Unstructured SWL (h/w)
الحمل الدراسي غير المنتظم للطالب أسبوعيا</td><td>5</td></tr>
<tr><td>Total SWL (h/sem)
الحمل الدراسي الكلي للطالب خلال الفصل</td><td colspan="3">150</td></tr>
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colspan Module Evaluation				

<table>
<tr><td colspan="6">Module Evaluation</td></tr>
<tr><td colspan="6">تقييم المادة الدراسية</td></tr>
<tr><td></td><td></td><td>Time/Number</td><td>Weight (Marks)</td><td>Week Due</td><td>Relevant Learning Outcome</td></tr>
<tr><td rowspan="4">Formative assessment</td><td>Quizzes</td><td>2</td><td>10% (10)</td><td>5 and 10</td><td>LO #1, #2 and #3, #4</td></tr>
<tr><td>Assignments</td><td>2</td><td>10% (10)</td><td>2 and 12</td><td>LO #5, #6 and #7, #8</td></tr>
<tr><td>Projects / Lab.</td><td>0</td><td>0%</td><td></td><td></td></tr>
<tr><td>Report</td><td>0</td><td>0%</td><td></td><td></td></tr>
<tr><td rowspan="2">Summative assessment</td><td>Midterm Exam</td><td>2hr</td><td>20% (10)</td><td>7</td><td>LO #1 - #4</td></tr>
<tr><td>Final Exam</td><td>3hr</td><td>60% (60)</td><td>16</td><td>All</td></tr>
<tr><td colspan="2">Total assessment</td><td></td><td>100% (100 Marks)</td><td></td><td></td></tr>
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<table>
<tr><td colspan="2">Delivery Plan (Weekly Syllabus)</td></tr>
<tr><td colspan="2">المنهاج الاسبوعي النظري</td></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Real numbers, Intervals</td></tr>
<tr><td>Week 2</td><td>Review of functions & graphs</td></tr>
<tr><td>Week 3</td><td>derivatives & integrals of transcendental functions.</td></tr>
<tr><td>Week 4</td><td>derivatives & integrals of limits Functions.</td></tr>
<tr><td>Week 5</td><td>derivatives & integrals of exponential Function</td></tr>
<tr><td>Week 6</td><td>derivatives & integrals of logarithmic Function</td></tr>
<tr><td>Week 7</td><td>Mid-term Exam + Techniques of integration</td></tr>
<tr><td>Week 8</td><td>double & triple integrals</td></tr>
<tr><td>Week 9</td><td>Partial Drivatives</td></tr>
<tr><td>Week 10</td><td>Applications of Differentiation</td></tr>
</table>

Week 11	Differential equations
Week 12	definition, first & second order eqs
Week 13	Solve second order Differential equations
Week 14	Applications of first & second order eqs
Week 15	special functions
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	Thomas, G. B., Weir, M. D., & Hass, J. (2018). Thomas' Calculus (14th ed.).	No
Recommended Texts	Basic Engineering Mathematics , John Bird, BSc (Hons), CMath, CEng, CSci, FIMA, FIET, MIEE, FIIE, FCollT (Fifth edition)	No
Websites	https://mathworld.wolfram.com/	

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><th colspan="5" align="center">Module Information
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<tr>
<td>Module Title</td>
<td colspan="2" align="center">English language I</td>
<td colspan="2">Module Delivery</td>
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<tr>
<td>Module Type</td>
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<td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td>
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<td>Module Level</td>
<td colspan="2">UGI</td>
<td>Semester of Delivery</td>
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<td>Administering Department</td>
<td colspan="2">PRE</td>
<td>College</td>
<td>PMEUOM</td>
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<tr>
<td>Module Leader</td>
<td colspan="2">Amira Rifae Hannawi</td>
<td>e-mail</td>
<td>amira.rifae@uomosul.edu.iq</td>
</tr>
<tr>
<td>Module Leader's Acad. Title</td>
<td colspan="2">Assist. Lecturer</td>
<td>Module Leader's Qualification</td>
<td>MSc.</td>
</tr>
<tr>
<td>Module Tutor</td>
<td colspan="2">Name (if available)</td>
<td>e-mail</td>
<td>E-mail</td>
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<tr>
<td>Peer Reviewer Name</td>
<td colspan="2">Name</td>
<td>e-mail</td>
<td>E-mail</td>
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<tr>
<td>Scientific Committee Approval Date</td>
<td colspan="2">01/06/2023</td>
<td>Version Number</td>
<td>1.0</td>
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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 Objectives أهداف المادة الدراسية	1. to enable the learner to communicate effectively and appropriately in real life situation. 2. to use English effectively for study purpose across the curriculum. 3. to develop interest in and appreciation of language 4. to develop and integrate the use of the language skills i.e. Reading, Speaking and Writing . 5. to revise and reinforce structure and grammar already learnt.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Define The ability to read English with understanding the student is able to understand the total content 2. Identify the ability to understand English when it is spoken. 3. Promote the ability to write English correctly . 4. Outline the correct usage of the grammatical items. 5. Describing and Identify some concepts of petroleum and mining study to enhance students' lexicon of specific terms . 6. List students' weaknesses in an attempt to strengthen and overcome them
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Present tense Simple present tens , the uses of simple present tense , present continuous tense, present perfective tense, vocabularies . [15 hrs] Part B – past tense Simple past tens , the uses of simple past tense , past continuous tense, past perfective tense, vocabularies . [15 hrs] Part c – future Future forms, Hot verbs- take, put – Telephoning , Expressions of quantity. – 'export and ex'port, Business expressions and numbers Modals and rel. [15hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering English language is to encourage students' participation in the exercises, discussion and use brainstorming by asking many questions to keep in touch with the students . while at the same time refining and expanding their critical thinking skills and give and receive feedback from the students. This will be achieved through classes, interactive tutorials and by considering types 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	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 and 10	LO #3 #4and #6
	Assignments	2	10% (10)	2 and 12	LO #1 #2 and #5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #1#2 and #4
Summative assessment	Midterm Exam	2hr	10% (10)	7	All
	Final Exam	3hr	50% (60)	16	All
Total assessment		100% (100 Marks)			

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Introduction - Simple present tens + vocabulary
Week 2	The uses of simple present tens + vocabulary
Week 3	present continuous tens + vocabulary
Week 4	Present perfective tense + vocabulary
Week 5	Present perfective continuous tense + vocabulary
Week 6	Examination
Week 7	Simple Past tense + vocabulary
Week 8	The uses of past tense + vocabulary
Week 9	Past continuous tense + vocabulary
Week 10	Past perfect tense + vocabulary
Week 11	Past perfective continuous tense + vocabulary
Week 12	Future forms, Hot verbs- take, put – Telephoning + vocabulary
Week 13	Expressions of quantity. – 'export and ex'port + vocabulary
Week 14	Business expressions and numbers + vocabulary
Week 15	Questions and negatives, - prefixes and antonyms, - Being polite +vocabulary
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	New-headway-plus-upper- intermediate-students-book. New-headway-plus-upperintermediate-students-workbook	No
Recommended Texts	Textbook and curriculums approved by the scientific committee and academic accreditation committee .	yes
Websites	Upper-Intermediate Fourth Edition | Headway Student's Site | Oxford University Press (oup.com) Tenses in Academic Writing | English for Uni | University of Adelaide	

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="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2" align="center"><strong style="color:red">Engineering Drawing</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2" align="center">S</td><td rowspan="4">☒ Theory
☐ Lecture
☐ Lab
☐ Tutorial
☒ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2" align="center"><strong style="color:red">PRE 115</td></tr>
<tr><td>ECTS Credits</td><td colspan="2" align="center">7</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2" align="center"><strong style="color:red">175</td></tr>
<tr><td>Module Level</td><td>UGI</td><td>Semester of Delivery</td><td>One</td></tr>
<tr><td>Administering Department</td><td>PRE</td><td>College</td><td>PMEUOM</td></tr>
<tr><td>Module Leader</td><td>Sarah Jamal Halata</td><td>e-mail</td><td>sarahjamal@umosul.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Assistant lecture</td><td>Module Leader's Qualification</td><td>MS.C</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td></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>11/06/2023</td><td>Version Number</td><td>1.0</td></tr>
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<table>
<tr><td colspan="4" align="center">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>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	1. Understanding the important of engineering drawing . 2. Learning how to draw the shapes, angels and lines and others which is essential for engineer. 3. Develop student's imagination and ability to represent the shape size and specifications of physical objects. 4. Understand the main idea of using dimension for engineering drawing. 5. Familiarize with different drawing equipment, technical standards and procedures for construction of geometric figures. This will give students ability to draw three-dimension objects on the paper and to draw the pectoral drawings. 6. Learning the principle of projection.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowing the aims of engineering. 2. Using a correct way in using instruments in engineering drawing. 3. Define the types of lines in engineering drawing. 4. Summarize how can draw the shapes, angels and lines and others which is essential for engineer. 5. Developing the ability to draw arcs and tangents. 6. Identify the correct way for writing dimensions. 7. Understanding how to draw any regular shape and ellipse. 8. Explain and draw the isometric drawing. 9. Explain the principle of projection.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Introduction about Engineering drawing and Instruments &their use** The purpose of engineering drawing ,The tools that are used in engineering drawing and how it are using ,Fixing the sheets and Layout the sheets of drawing (9hrs). **Types of line** Know all type of lines in engineering drawing and the which pencils are used to draw each type (3hrs). **Constructional geometry** draw the single line, parallel lines by many method using triangles or by compass and dividing the line and angle to equal parts, Making tangents (6 hrs). **Dimensions** Learn the roles of writing the dimensions and scales in engineering drawing (9hrs). **Tangent arc** Learning the draw of arc tangents a line, arc tangents a point and arc tangents another arc (9hrs) **Regular polygon and Ellipse** Triangles ,square , pentagon , hexagon & the method of how to draw any regular polygon . (12hrs). **Reverse curves (6hrs)**

	Isometric drawing
	Isometric drawing for objects contain perpendicular surfaces, include surfaces.
	and curved surfaces. (18hrs)
	Sketching (3hrs).
	Projections
	The types and principle of projection(6hrs)

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	In this course the topics covered are based on syllabus for undergraduate studies in engineering. the lecture would be arranged in a sequences and starts from the basic concepts of geometrical construction and engineering curves and progress and isometric drawing to the principles of projections, the Strategies of this course include : **Lectures**: theoretical subject will be explained through lecture. **Classwork**: after all theoretical lectures the student draws and applies a exercise which achieves the aim of lecture. **Homework :** every week , homework will be given to increase a skill of a student.

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	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 12	LO #1, #2,#3,#4,#6 and LO #8
	Classwork	14	15% (15)	2 - 15	All
	Homework	14	15% (15)	2- 15	All
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 about Engineering drawing, Instruments &their use
Week 2	Fixing the sheets, Types of line, Lettering, Layout the sheets of drawing
Week 3	Constructional geometry (draw the single line, parallel lines, dividing the line and angle, Making tangents
Week 4	Dimensions
Week 5	Scale, Units, Quiz
Week 6	Tangent arc (arc tangents a line, arc tangents a point)
Week 7	Tangent arc (arc tangents another arc), Midterm Exam
Week 8	Regular polygon (Triangles, square, pentagon, hexagon & the method of how to draw any regular polygon .
Week 9	Reverse curves.
Week 10	Ellipse (draw the ellipse by many methods)
Week 11	Isometric drawing for objects contain perpendicular surfaces.
Week 12	Isometric drawing for objects contain include surfaces ,Quiz
Week 13	Isometric drawing for objects contain curved surfaces
Week 14	Sketching.
Week 15	Projections

<table>
<tr><td colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Engineering drawing and Graphic technology by Thomas E.Frengh , Charles J.Vierck ,1993. Robert J.Faster</td><td>Yes</td></tr>
<tr><td>Recommended Texts</td><td>Engineering Drawing (plane and solid geometry) by N. D. BHATT , 2011</td><td>No</td></tr>
<tr><td>Websites</td><td></td><td></td></tr>
</table>

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	Human Rights and Democracy	**Module Delivery**	
Module Type	Basic	☒ Theory	
Module Code	PRE 116	☐ Lecture	
ECTS Credits	2	☐ Lab	
SWL (hr/sem)	50	☐ Tutorial ☐ Practical ☐ Seminar	
Module Level	UGI	**Semester of Delivery**	One
Administering Department	PRE	**College**	PMEUOM
Module Leader	Dr Yasser Hassan Kddo	**e-mail**	dryasser.hassan@uomosul.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	01/06/2023	**Version Number**	1.0

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

<table>
<tr>
<td colspan="2" align="center">**Module Aims, Learning Outcomes and Indicative Contents**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</td>
</tr>
<tr>
<td>أهداف المادة الدراسية</td>
<td>أ- توعية الطالب بأهمية القانون في المجتمع.
ب- تمكين الطالب من معرفة حقوقه وواجباته في الدولة القانونية .
ج- تمكين الطالب من المهارات العملية للمطالبة العلنية بحقوقهم.
د- مساهمة الطالب في بناء دولة القانون.</td>
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<tr>
<td>مخرجات التعلم للمادة الدراسية</td>
<td>الأهداف المعرفية:
1 .التعرف على مفهوم حقوق الإنسان وأهميتها.
2. التعرف على أنواع حقوق الإنسان.
3.التعرف على الحريات العامة في الدستور العراقي.
4. دراسة الواقع العملي المحيط الطالب في الجامعة والمجتمع ، من الناحية القانونية.
5. تعرف على انواع الأنظمة السياسية من حيث ممارسة السلطة.
6. دراسة مبادئ الديمقراطية في الدستور العراقي.
الأهداف المهاراتية الخاصة بالمقرر:
1. تعليم الطالب مهارات الاختلاف بالرأي وقبول الرأي الآخر
2. كيفية تنظيم طلب قانوني للمطالبة بالحقوق والحريات.</td>
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<tr>
<td>المحتويات الإرشادية</td>
<td>أ .نظرية الحق تعريف الحق وحقوق الأنسان وتعريف الديمقراطية وما الفرق بين الديمقراطية والحرية ب.أنواع الحقوق والحريات الأساسية والحقوق الأقتصادية والأجتماعية والثقافية
ج.مصادر حقوق الأنسان في القانون الدول
ي د.حقوق الأنسان أثناء السلم والحرب
ه.أنواع الأنظمة السياسية من حيث ممارسة السلطة الضمانات الدستورية القضائية لحقوق الأنسان</td>
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<table>
<tr>
<td colspan="2" align="center">**Learning and Teaching Strategies**
استراتيجيات التعلم والتعليم</td>
</tr>
<tr>
<td>استراتيجيات التعلم</td>
<td>1. المحاضرات النظرية .
2. المناقشات داخل القاعة الدراسية.
3. المقالات.</td>
</tr>
</table>

<table>
<tr>
<td colspan="4" align="center">**Student Workload (SWL)**
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا</td>
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<tr>
<td>**Structured SWL (h/sem)**
الحمل الدراسي المنتظم للطالب خلال الفصل</td>
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<td>**Structured SWL (h/w)**
الحمل الدراسي المنتظم للطالب أسبوعيا</td>
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<td>**Unstructured SWL (h/sem)**
الحمل الدراسي غير المنتظم للطالب خلال الفصل</td>
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<td>**Unstructured SWL (h/w)**
الحمل الدراسي غير المنتظم للطالب أسبوعيا</td>
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<td>**Total SWL (h/sem)**
الحمل الدراسي الكلي للطالب خلال الفصل</td>
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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 #4, #5
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6
	Report	1	10% (10)	13	LO #4, #5 and #6
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	أن يتعرف الطالب على مفهوم حقوق الإنسان
Week 2	أن يتعرف الطالب على الخصائص العامة لحقوق الإنسان
Week 3	أن يتعرف الطالب على مراحل تطور حقوق الإنسان
Week 4	أن يتعرف الطالب على المبادئ العامة لحقوق الإنسان في الأديان السماوية
Week 5	أن يتعرف الطالب على مضامين حقوق المرأة والطفل في الدين الإسلامي
Week 6	أن يتعرف الطالب على المصادر الدولية لحقوق الإنسان في زمن السلم
Week 7	أن يتعرف الطالب على المصادر الدولية لحقوق الإنسان في زمن الحرب
Week 8	أن يتعرف الطالب على الحقوق المدنية والسياسية والأقتصادية والأجتماعية والثقافية في الدستور العراقي
Week 9	أن يتعرف الطالب على مفهوم الديمقراطية ومميزاتها ومقوماتها
Week 10	يتعرف الطالب على صور الديمقراطية (الديمقراطية المباشرة - الديمقراطية غير المباشرة - الديمقراطية شبه المباشرة
Week 11	أن يتعرف الطالب على أنواع الديمقراطية النيابية (النظام الرئاسي+ النظام البرلماني)
Week 12	أن يتعرف الطالب على أنواع الديمقراطية النيابية (النظام المجلسي + النظام المختلط)
Week 13	أن يتعرف الطالب على أنواع الديمقراطية النيابية (النظام المجلسي + النظام المختلط)
Week 14	أن يتعرف الطالب على الضمانات الدستورية لتطبيق النظام الديمقراطي
Week 15	أن يتعرف الطالب على الضمانات القضائية لتطبيق النظام الديمقراطي
Week 16	الامتحان النهائي

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?
الكتب المقررة المطلوبة	1د. حميد حنون خالد ، حقوق الانسان ، مكتبة السنهوري ، بغداد ، 2- 2009.د. ماهر صالح الجبوري وآخرون ، حقوق الإنسان والطفل والديمقراطية ، وزارة التعليم العالي والبحث العلمي ، العراق ، 2009 .	Yes
المراجع الرئيسية	1د. حميد موحان عكوش و أياد خلف محمد ، الديمقراطية والحريات العامة ، ط1 ، مكتبة السنهوري ، بغداد ، 2013 2- .د. حميد حنون خالد ، الأنظمة السياسية ، مكتبة السنهوري ، بغداد ، 2012 3- .د. جواد الهنداوي ، القانون الدستوري والنظم السياسية ، دار العارف للمطبوعات ، لبنان ، 2012	No

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="5" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td colspan="2" align="center">Geology for Engineer II</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2" align="center">S</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☒ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2" align="center">PRE 117</td></tr>
<tr><td>ECTS Credits</td><td colspan="2" align="center">7</td></tr>
<tr><td>SWL (hr/sem)</td><td colspan="2" align="center">175</td></tr>
<tr><td>Module Level</td><td>UGI</td><td>Semester of Delivery</td><td colspan="2">Two</td></tr>
<tr><td>Administering Department</td><td>PRE</td><td>College</td><td colspan="2">PMEUOM</td></tr>
<tr><td>Module Leader</td><td>Yasser Hassan Kddo</td><td>e-mail</td><td colspan="2">dryasser.hassan@uomosul.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Lecturer</td><td>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="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>01/06/2023</td><td>Version Number</td><td colspan="2">1.0</td></tr>
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العلاقة مع المواد الدراسية الأخرى</td></tr>
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	Module Aims, Learning Outcomes and Indicative Contents
	أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية
Module Objectives أهداف المادة الدراسية	The main objectives of the course are: This course aims in helping the students: • To know the basic of Plate tectonic theories and Continental drift hypothesis. • To introduce fundamental aspects of Plate tectonic boundaries. • Understand the Earth quake & mountain building activity • Student will gain knowledge about Stress, Strain and Defomation. • To introduce fundamental aspects of Structural geology . • Student will gain knowledge about Folds, Joints and Faults. • To introduce fundamental aspects of paleontology. • To know the basic of fossilization and types of fossils. • To introduce fundamental aspects of Stratigraphy. • The student will get to learn in detail the Iraqi Stratigraphy. • To understand the Geological time scale. • Understanding the origin and accumulation aspects of hydrocarbon fields in Iraq.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: 1. Gain Knowledge about the history of Earth's development. 2. Historical development of continental movements. 3. Learn how mountains, earthquakes and volcanic eruption occurs. 4. Understand the different types of Folds and Faults 5. Understand structural Petroleum traps. 6. Learn how fossils formed and its applications was. 7. Describe and identify fossils based on their morphology and their modification with time. 8. Deal with Categories of Stratigraphic Classification 9. Learn the development of life forms on the earth. 10. Know Various aspects of the hydrocarbon system.

Indicative Contents
 	
المحتويات الإرشادية
	Indicative content includes the following.
	Part A – Continetnal drift hypotheis and plate tectonic theory.
	(Alfered Wegner hypothesis- Plate tectonic- Convergent plate boundaries – Divergent plate boundaries – Transform plate boundaries). [10 hrs.]
	Part B- Structral geology
	   – The description of folds – anticline – syncline – symmetrical fold – assymetical folds – overturned folds) - Normal fault – reverse fault- thrust fault – Joints) [15hrs]
	Part C- The Paleontology and Stratigraphy
	   – Fossils – Microfossils – Index fossils- type of fossilization – Correlation and age determination. Principle of serigraphy – Lithostrigrphic units – Biostratigrphic units – Chronostrigraphic units. [20hrs]
	Part D – Geological time scale
	   – Relative and absolute age- Precambrian- Phanerozoic – Paleozoic – Mesozoic and Cenozoic age) . [20hrs].
	Part F- Hydrocarbon Accumulation
	   – Petroleum system – types of traps- types of kerogens – Iraqi Oil Fields
	   – [15hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	This course is designed to give students a fundamental understanding of very important branches of geology, teach the understand how was morphologic earth change over time and how the modern contents formed. How crustal movement make up deformation like folds and faults and metamorphic rocks also study very. The course main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises to know how can use the student the tools like fossils in the petroleum exploration.

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	82	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction: Continental drift and Plate Tectonic theory.
Week 2	Plate Tectonic Boundaries
Week 3	Structural Geology
Week 4	Type of Folds
Week 5	Types of Faults and Joints
Week 6	Types of Petroleum Traps
Week 7	Paleontology and Fossils
Week 8	Microfossils
Week 9	Stratigraphy Principles
Week 10	Lithostratigrpahic Units
Week 11	Biostratigrphic and Chronostratigraphic Units
Week 12	Geological Time Scale
Week 13	Paleozoic – Mesozoic – Cenozoic
Week 14	The Petroleum System
Week 15	Iraqi Oil Fields
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Contour maps and their interpretation - Exercises to predict trend of the outcrop of horizontal, vertical and inclined beds with respect to topography - Deciphering dip and strike of outcrops.
Week 2	Construction of map when 3 points over a bedding plane are given - Construction of vertical section - Order of superposition - vertical thickness of formation.
Week 3	Reading of folds and fault maps - Construction of vertical sections - Determination of ages of structures - Geological history.
Week 4	Solving simple dip and strike problems by Trigonometrical and graphictrigonometrical methods.al methods -determination of true thickness of beds by calculations - Three point problems by Training on surveying tools: theodolite , GPS, and other field instruments to create a geologic map & cross sections.
Week 5	Study the importance of macro fossils: Brachiopoda ,Pelecepoda , Castropoda , Graptolites , Coral , Trilobite , Plants
Week 6	Study the importance of microfossils Foraminifera , Ostracoda , Pollen and Spores , nanocalcareous (thin section).
Week 7	Study the importance of microfossils Dinoflagellates, Acritarchs.

Learning and Teaching Resources

	Text	Available in the Library?
	مصادر التعلم والتدريس	
Required Texts	Banger, K.M., 2004; Principles of Engineering Geology. Standard publisher's distributors. 1705-B,Nai Sarak,delhi-110006.	Yes
Recommended Texts	Parbin,S., 2004; Engineering and General geology. Six edition (revised and enlarged). S,K,Kataria and sons. J.S.Offset printers.	No
Websites	https://www.coursera.org/courses?query=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

نموذج وصف المادة الدراسية

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<tr>
<td>Module Leader</td>
<td>Ayad M. Ahmed Alwaise</td>
<td>e-mail</td>
<td colspan="2">E-mail; Ayad_waise@yahoo.com</td>
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<td>Module Leader's Acad. Title</td>
<td>Lecturer</td>
<td>Module Leader's Qualification</td>
<td colspan="2">Ph.D.</td>
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<tr>
<td>Module Tutor</td>
<td>Sarah Saad Abduljabbar</td>
<td>e-mail</td>
<td colspan="2">sarahsaad3860707@uomosul.edu.iq</td>
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<tr>
<td>Peer Reviewer Name</td>
<td>Name</td>
<td>e-mail</td>
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العلاقة مع المواد الدراسية الأخرى</td></tr>
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<td>Prerequisite module</td>
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<td>Co-requisites module</td>
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	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 dynamics and applications physics theory through the application of techniques. 2. To understand displacements, velocity and accelerations system. 3. This course deals with the basic concept of Mechanical Engineering. 4. This is the basic subject for all Dynamics and forces applications. 5. To understand concept of work and energy problems. 6. The forces that act on an object can be external, such as gravity, friction, or air resistance, or they can be internal, such as the forces that hold the particles of an object together	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completion of the course, the student should be able to: 1. Explain and calculate the centroid and moment of inertia for rigid bodies 2. Describe and calculate the motion (position, velocity, acceleration) for particles and solids in plane motion. 3. Apply free-body diagrams and solve Newton's 2nd law for plane problems. 4. Use different approaches to solve dynamic problems of particles in plane motion. 5. Understand the concepts of work, kinetic energy, potential energy relations, as well as linear and angular impulse and momentum 6. Analyze forces to describe the motion of rigid bodies using Newton's 2nd law directly or indirectly using work, energy, impulse, and momentum.	
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Dynamics is a branch of physics that deals with the study of motion and forces acting on a body. It is the study of how objects move, interact with each other, and respond to different forces. Dynamics is an important subject in physics, and it is used to explain many natural phenomena, from the movement of planets to the behavior of tiny particles. [15 hrs.] Dynamics is concerned with the motion of objects, and it is often used to describe the movement of objects in three dimensions. In dynamics, the focus is on understanding how forces affect the motion of an object. The forces that act on an object can be external, such as gravity, friction, or air resistance, or they can be internal, such as the forces that hold the particles of an object together. Dynamics is a complex subject, and it requires a deep understanding of physics and mathematics to fully grasp its principles. Dynamics is a fundamental part of physics, and it is used in many different fields, from engineering to astronomy. [15 hrs.] It deals with the study of forces acting on objects that are not moving. The primary objectives of Dynamics are to determine the forces acting on an object, the moments of forces acting on an object, and the equilibrium conditions of an object. The study of Dynamics is essential for the design of structures, such as bridges, buildings, and machines, to ensure that they are safe and reliable. [10 hrs.] Revision problem classes [6 hrs.]	

	The study of dynamics is also important in understanding the behavior of materials under different conditions. Understanding dynamics is crucial in the design and construction of machines and structures, as it allows engineers to predict how these objects will behave under different forces. In astronomy, dynamics is used to study the movement of planets and stars, and it is used to predict the behavior of celestial bodies over time. As such, dynamics is a critical subject in physics, and it is essential for anyone who wants to study the natural world in depth. [15 hrs.]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main approach for delivering this module is to foster student engagement and enhance their critical thinking abilities through active participation in exercises. This will be achieved by conducting classes, interactive tutorials, and incorporating captivating experiments that involve practical sampling activities.

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	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
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	3	10% (10)	3,5 and 10	LO #1, 2, and 5
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6,
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #4, #5 and #6
Summative assessment	Midterm Exam	2hr	10% (10)	7	LO #1 - #3
	Final Exam	3hr	60% (60)	16	All
Total assessment		100% (100 Marks)			

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Centroid
Week 2	Moment of Inertia
Week 3	Frictions
Week 4	Introduction to engineering mechanics (Dynamics)
Week 5	Rectilinear Kinematics: Continuous Motion
Week 6	Rectilinear Kinematics: Continuous Motion
Week 7	Rectilinear Kinematics: Erratic Motion
Week 8	General Curvilinear Motion
Week 9	General Curvilinear Motion
Week 10	Motion of a Projectile
Week 11	Absolute Dependent Motion Analysis of Two Particles
Week 12	Absolute Dependent Motion Analysis of Two Particles
Week 13	The Work of a Force
Week 14	The Work of a Force
Week 15	Principle of Work and Energy
Week 16	**Preparatory week before the final Exam**

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

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	R. C. Hibbeler, **Engineering Mechanics: Dynamics** 13th edition	Yes
Recommended Texts	J.L. Meriam, L.G. Kraige and J. N. Bolton. **Engineering Mechanics: Dynamics** 8th edition, 2015.	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

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معلومات المادة الدراسية</th></tr>
<tr><td>Module Title</td><td colspan="2">Mathematics 2</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td colspan="2">B</td><td rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☒ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td colspan="2">PRE 119</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>UGI</td><td>Semester of Delivery</td><td>1</td></tr>
<tr><td>Administering Department</td><td>PRE</td><td>College</td><td>PMEUOM</td></tr>
<tr><td>Module Leader</td><td>Ziadoon M.Khaleel</td><td>e-mail</td><td>ziadoon.khaleel@uomosul.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Assistant Lecturer</td><td>Module Leader's Qualification</td><td>MSc.</td></tr>
<tr><td>Module Tutor</td><td></td><td>e-mail</td><td></td></tr>
<tr><td>Peer Reviewer Name</td><td></td><td>e-mail</td><td></td></tr>
<tr><td>Scientific Committee Approval Date</td><td>1/6/2023</td><td>Version Number</td><td>1.0</td></tr>
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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
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Apply mathematical principles and concepts to solve engineering problems. 2. Develop proficiency in mathematical modeling and analysis for engineering systems. 3. Use mathematical tools and techniques to optimize engineering designs and processes. 4. Foster critical thinking and problem-solving skills in an engineering context. 5. Enhance understanding of advanced mathematical topics relevant to engineering disciplines. 6. Bridge theoretical knowledge of mathematics with practical engineering applications. 7. Develop a strong foundation in mathematical techniques used in specific engineering disciplines. 8. Enhance quantitative reasoning skills for making informed engineering decisions. 9. Foster an appreciation for the role of mathematics in engineering and its significance in solving real-world problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Apply mathematical principles and concepts to solve engineering problems. Define polar coordinates as an alternative coordinate system to Cartesian coordinates. Understand the representation of points in polar coordinates using the radial distance (r) and angle (θ). 2. Conversion between Polar and Cartesian Coordinates: Convert between polar coordinates (r, θ) and Cartesian coordinates (x, y) using trigonometric relationships. Express equations and curves in polar form and convert them to Cartesian form, and vice versa. 3. Graph polar equations and understand the relationship between the shape of the graph and the equation's parameters. Plotting Points and Graphs in Polar Coordinates. 4. Polar Functions and Equations: Identify and analyze different types of polar equations, including circles, cardioids, limaçons, and roses Determine the symmetry and properties of polar equations based on their equations and parameters. 5. Understanding Vectors and Scalars: Differentiate between vectors and scalars and understand their properties. Distinguish between position vectors, displacement vectors, and other types of vectors in various contexts. 6. Vector Algebra and Geometry: Apply vector algebraic operations to solve problems involving vector quantities. Understand geometric interpretations of vector operations, such as vector addition and scalar multiplication. 7. understanding Taylor and Maclaurin series 8. Understanding the Laplace Transform: Define the Laplace transform as an integral transform that converts a function of time into a function of a complex variable. Understand the properties and conditions for the existence of the Laplace transform. Recognize the Laplace transform as a powerful tool for solving differential equations and analyzing systems. 9. Define Fourier series as a representation of a periodic function as an infinite sum of sin and cosin functions (or complex exponentials). Understand the concept of periodicity and the fundamental period of a function. Recognize Fourier series as a tool to analyze and approximate periodic functions.

	Indicative content includes the following.
Indicative Contents المحتويات الإرشادية	**Part A – Mathematic Theory** Polar Coordinates: Introduction to polar coordinates [2 hrs], change of variable from Cartesian to polar[2 hrs] , Transformation of coordinates . Cartesian , cylindrical , spherical and bipolar coordinate [2 hrs]. Vectors and Scalars: Vectors and scalars [2 hrs], gradient of scalar fields [2 hrs] , vector fields and their divergence and curl line and surface integral[2 hrs]. Taylor and Maclaurin series [2 hrs]. differentiation of analytical function [2 hrs]. Integral transform [2 hrs]. Laplace transform [4 hrs]. Fourier series [2 hrs]. solution of potential [2 hrs]. Fourier transform, digital filtering process [2 hrs]. complex numbers. [2 hrs]. **[30 hrs]** **Part B – Tutorial** Polar Coordinates: change of variable from Cartesian to polar[2 hrs] , Transformation of coordinates . Cartesian , cylindrical , spherical and bipolar coordinate [4 hrs]. Vectors and Scalars: Vectors and scalars [2 hrs], gradient of scalar fields [2 hrs] , vector fields and their divergence and curl line and surface integral[2 hrs]. Taylor and Maclaurin series [2 hrs]. differentiation of analytical function [2 hrs]. Integral transform [2 hrs]. Laplace transform [4 hrs]. Fourier series [2 hrs]. solution of potential [2 hrs]. Fourier transform, digital filtering process [2 hrs]. complex numbers. [2 hrs]. **[30 hrs]** **Part c – Online** Polar Coordinates: change of variable from Cartesian to polar[1 hrs] , Transformation of coordinates . Cartesian , cylindrical , spherical and bipolar coordinate [2 hrs]. Vectors and Scalars: Vectors and scalars [1 hrs], gradient of scalar fields [1 hrs] , vector fields and their divergence and curl line and surface integral[1 hrs]. Taylor and Maclaurin series [1 hrs]. differentiation of analytical function [1 hrs]. Integral transform [1 hrs]. Laplace transform [2 hrs]. Fourier series [1 hrs]. solution of potential [1 hrs]. Fourier transform, digital filtering process [1 hrs]. complex numbers. [1 hrs]. **[15 hrs]**

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	Active Learning: Encourage students to actively engage with the material through problem-solving, discussions, and interactive activities. Provide opportunities for students to work on problems individually and in groups, promoting critical thinking and understanding of concepts Conceptual Understanding: Emphasize the underlying concepts and principles of calculus rather than focusing solely on procedures and calculations. Use real-world examples and applications to illustrate the relevance of calculus concepts. Problem-Solving Approach: Encourage students to approach problem-solving strategically, emphasizing the importance of planning, organizing, and reasoning through each step. Use of Resources: Utilize the textbook as a primary resource, complementing it with supplementary materials, including online resources, video tutorials, and practice exercises.

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	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

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<tr><td colspan="6" align="center">**Module Evaluation**
تقييم المادة الدراسية</td></tr>
<tr><td></td><td></td><td>**Time/Number**</td><td>**Weight (Marks)**</td><td>**Week Due**</td><td>**Relevant Learning Outcome**</td></tr>
<tr><td rowspan="4">**Formative assessment**</td><td>**Quizzes**</td><td>2</td><td>10% (10)</td><td>5 and 10</td><td>LO #1, #2 and #3, #4</td></tr>
<tr><td>**Assignments**</td><td>2</td><td>10% (10)</td><td>2 and 12</td><td>LO #5, #6 and #7,9</td></tr>
<tr><td>**Projects / Lab.**</td><td>1</td><td>10% (10)</td><td>Continuous</td><td>All</td></tr>
<tr><td>**Report**</td><td>1</td><td>10% (10)</td><td>13</td><td>LO #1#2 and #8 #9</td></tr>
<tr><td rowspan="2">**Summative assessment**</td><td>**Midterm Exam**</td><td>2hr</td><td>10% (10)</td><td>7</td><td>LO #1 - #6</td></tr>
<tr><td>**Final Exam**</td><td>3hr</td><td>50% (50)</td><td>16</td><td>All</td></tr>
<tr><td colspan="2">**Total assessment**</td><td></td><td>100% (100 Marks)</td><td></td><td></td></tr>
</table>

<table>
<tr><td colspan="2" align="center">**Delivery Plan (Weekly Syllabus)**
المنهاج الاسبوعي النظري</td></tr>
<tr><td></td><td>**Material Covered**</td></tr>
<tr><td>**Week 1**</td><td>Introduction to polar coordinates</td></tr>
<tr><td>**Week 2**</td><td>change of variable from Cartesian to polar</td></tr>
<tr><td>**Week 3**</td><td>Vectors and scalars</td></tr>
<tr><td>**Week 4**</td><td>gradient of scalar fields</td></tr>
<tr><td>**Week 5**</td><td>vector fields and their divergence and curl line and surface integral.</td></tr>
<tr><td>**Week 6**</td><td>Transformation of coordinates . Cartesian , cylindrical , spherical and bipolar coordinate</td></tr>
<tr><td>**Week 7**</td><td>Taylor and Maclaurin series</td></tr>
<tr><td>**Week 8**</td><td>differentiation of analytical function</td></tr>
<tr><td>**Week 9**</td><td>Integral transform</td></tr>
<tr><td>**Week 10**</td><td>Laplace transform</td></tr>
<tr><td>**Week 11**</td><td>Systems of equations,</td></tr>
<tr><td>**Week 12**</td><td>Fourier series</td></tr>
<tr><td>**Week 13**</td><td>solution of potential
Eqs., heat eq. & wave eq. ,numerical solution of partial Differential eqs.</td></tr>
<tr><td>**Week 14**</td><td>Fourier transform, digital filtering process</td></tr>
<tr><td>**Week 15**</td><td>complex numbers.</td></tr>
<tr><td>**Week 16**</td><td>**Preparatory week before the final Exam**</td></tr>
</table>

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	Thomas, G. B., Weir, M. D., & Hass, J. (2018). Thomas' Calculus (14th ed.).	No
Recommended Texts	Basic Engineering Mathematics , John Bird, BSc (Hons), CMath, CEng, CSci, FIMA, FIET, MIEE, FIIE, FCollT (Fifth edition)	No
Websites	https://mathworld.wolfram.com/	

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="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td align="center"><strong style="color:red">English language II</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td align="center">B</td><td colspan="2" rowspan="4">☒ Theory
☒ Lecture
☐ Lab
☐ Tutorial
☐ Practical
☐ Seminar</td></tr>
<tr><td>Module Code</td><td align="center"><strong style="color:red">PRE120</td></tr>
<tr><td>ECTS Credits</td><td align="center">2</td></tr>
<tr><td>SWL (hr/sem)</td><td align="center"><strong style="color:red">50</td></tr>
<tr><td>Module Level</td><td>UGI</td><td>Semester of Delivery</td><td>Two</td></tr>
<tr><td>Administering Department</td><td>PRE</td><td>College</td><td>PMEUOM</td></tr>
<tr><td>Module Leader</td><td>Amira Rifae Hannawi</td><td>e-mail</td><td>amira.rifae@uomosul.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Assist. Lecturer</td><td>Module Leader's Qualification</td><td>MSc.</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>01/06/2023</td><td>Version Number</td><td>1.0</td></tr>
</table>

<table>
<tr><td colspan="3" align="center">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>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	1. to enable the learner to communicate effectively and appropriately in real life situation. 2. to use English effectively for study purpose across the curriculum. 3. to develop interest in and appreciation of language 4. to develop and integrate the use of the language skills i.e. Reading, Speaking and Writing . 5. to revise and reinforce structure and grammar already learnt.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Define The ability to read English with understanding the student is able to understand the total content 2. Identify the ability to understand English when it is spoken. 3. Promote the ability to write English correctly . 4. Outline the correct usage of the grammatical items. 5. Describing and Identify some concepts of petroleum and mining study to enhance students' lexicon of specific terms . 6. List students' weaknesses in an attempt to strengthen and overcome them 7. Encourage student to write reports about different topics . 8. Enforce their language by giving them assignment that strengthen the method of research and writing
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. types of sentences An affirmative sentence (a declarative or assertive) sentence, and it can be either a simple, complex or compound sentence as long as it is positive , Negative and interrogative sentences . [15hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering English language is to encourage students' participation in the exercises, discussion and use brainstorming by asking many questions to keep in touch with the students .In this course we will also encourage students how to write , read and discuss different scientific topics . while at the same time refining and expanding their critical thinking skills and give and receive feedback from the students. This will be achieved through classes, interactive tutorials and by considering types 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	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)	6 and 12	LO #3 #4and #6
	Assignments	2	10% (10)	2 and 12	LO #1 #2 and #5 #8
	Report	1	10% (10)	13	LO #1#2 and #4 #7
Summative assessment	Midterm Exam	2hr	10% (10)	7	All
	Final Exam	3hr	60% (60)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - Simple sentence + reading and listening scientific passage
Week 2	Compound sentence + reading and listening scientific passage
Week 3	Complex sentence + reading and listening scientific passage
Week 4	Affirmative sentence (declarative or assertive) + reading and translating scientific passage
Week 5	Negative, positive and interrogative sentences + reading and listening scientific passage
Week 6	Examination
Week 7	Numbers and Measurement + reading and translating scientific passage
Week 8	Describing Equipment + reading and translating scientific passage
Week 9	Giving Instructions + reading and translating scientific passage
Week 10	Safety + reading and translating scientific passage
Week 11	Describing Systems + reading and translating scientific passage
Week 12	Making Comparisons + reading and translating scientific passage
Week 13	Describing Processes + reading and translating scientific passage
Week 14	Expressing Possibility + reading and translating scientific passage
Week 15	Countable/uncountable nouns How much/how many + reading and translating scientific passage
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	

<table>
<tr><td colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Levrai. P (2020) English for Oil and Gas FOUNDATION COURSE .TTLINTERNATIONAL
Frendo.E with Bonamy, D(1997) English for the Oil industry , PEARSON LONGMAN .</td><td>No</td></tr>
<tr><td>Recommended Texts</td><td>Textbook and curriculums approved by the scientific committee and academic accreditation committee.</td><td>No</td></tr>
<tr><td>Websites</td><td>https://academicguides.waldenu.edu/writingcenter/scholarlyvoice/sentencestructure
https://byjus.com/english/types-of-sentences/</td><td></td></tr>
</table>

<table>
<tr><td colspan="5">Grading Scheme
مخطط الدرجات</td></tr>
<tr><td>Group</td><td>Grade</td><td>التقدير</td><td>Marks %</td><td>Definition</td></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>
</table>

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	**Engineering Drawing using computer**	**Module Delivery**	
Module Type	**S**	☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	**PRE 121**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	UGI	**Semester of Delivery**	Two
Administering Department	PER	**College**	PMEUOM
Module Leader	Sarah Jamal Halata	**e-mail**	sarahjamal@umosul.edu.iq
Module Leader's Acad. Title	Assistant lecture	**Module Leader's Qualification**	MS.C
Module Tutor		**e-mail**	
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	11/06/2023	**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 Objectives أهداف المادة الدراسية	1. Understanding the advantage of engineering drawing using computer. 2. Knowing how to save and export files and adjustment the size and units. 3. Knowing all the menu in the menu bar. 4. Learning each command in the Draw list. 5. Learning each command in the Modify list. 6. Understand how to draw 2D in AutoCAD. 7. Understand how modify any shapes. 8. Explain and draw the projections of 3D shapes. 9. Conclusion the 3D shapes from there projection. 10. Learning the principle of 3D shapes
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define the advantage of using computer in engineering drawing. 2. Explain the contents of the window of AutoCAD programs. 3. Adjustment the boundary of screen and units. 4. Develop skills in using every command in Draw list & Modify list. 5. Developing the ability to draw 2D shapes with explain all dimensions. 6. Ably to change properties of lines . 7. Conclusion the projections of 3D shapes. 8. Explain and draw the isometric drawing. 9. Conclusion the isometric drawing from projections. 10. Develop skills in 3D .
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Introduction about computer and AutoCAD** component of AutoCAD screen , Title bar ,Menu bar , properties,. Make a new drawing, saving , Adjustment the boundary of screen and units ,command line. (12hrs). **Draw list** Line, Xline, circle, polygon ,, Arc ,polyline, point ,Ellipse ,Text ,Block (12hrs). **Modify list** Erase ,offset ,copy , Rotate , Array ,Trim ,Extend , Mirror ,Move , Explode ,Fillet , Chamfer (12hrs). **Object snap , Polar tracking ,** **Dimensions.**(6hrs) **Projection** Introduction about projections , Type of projections , projections in third angle , projection of objects contain perpendicular surface only , projection of objects contain include surface, projection of curved surfaces(12hrs). **Finding a missing view , Section.** (6hrs). **Isometric drawing**

	Isometric drawing for objects contain perpendicular surfaces, include surfaces. and curved surfaces. (12hrs)
	3D in AutoCAD
	Introduction about 3D in AutoCAD(6hrs).
	Assembly , finding the 3D viewing from projection (6hrs).

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	In this course the topics covered are based on syllabus for undergraduate studies in engineering. the lecture would be arranged in a sequences and starts from the knowing about all menus in menu bar and the commands of , the Strategies of this course include : **Lectures**: theoretical subject will be explained through lecture. **Classwork**: after all theoretical lectures the student draws and applies a exercise which achieves the aim of lecture. **Homework :** every week , homework will be given to increase a skill of a student.

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	32	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
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)	6 and 11	LO #1, #2,#3,#4,#5,#6 and LO#7.
	Classwork	14	15% (15)	2 – 15	All
	Homework	14	15% (15)	2- 15	All
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Introduction about computer and AutoCAD , component of AutoCAD screen , Title bar ,Menu bar , properties.
Week 2	Make a new drawing , saving ,unite , boundary of screen ,command line.
Week 3	Draw list Line, Xline, circle, polygon
Week 4	Draw list Arc ,polyline, point ,Ellipse ,Text ,Block
Week 5	Modify list Erase ,offset ,copy , Rotate ,properties .
Week 6	Modify list Array ,Trim ,Extend , Mirror ,Move , Explode ,Fillet , Chamfer , Quiz
Week 7	Object snap , Polar tracking , Midterm Exam
Week 8	Dimensions.
Week 9	Projection Introduction about projections , Type of projections , projections in third angle , projection of objects contain perpendicular surface only.
Week 10	projection of objects contain include surface, projection of curved surfaces.
Week 11	Finding a missing view , Section, Quiz.
Week 12	Isometric drawing for objects contain perpendicular surfaces.
Week 13	Isometric drawing for objects contain include surfaces, Isometric drawing for objects contain curved surfaces
Week 14	3D in AutoCAD Introduction about 3D in AutoCAD
Week 15	Assembly , finding the 3D viewing from projection

<table>
<tr><th colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</th></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Engineering drawing from first principles using AutoCAD by Dennis Maguirs.</td><td>NO</td></tr>
<tr><td>Recommended Texts</td><td>A Student Guide for In-Depth Coverage of AutoCAD's AutoCAD 2023 Instructor, James Leach ,Shawna Lockhart, 2023.</td><td>NO</td></tr>
<tr><td>Websites</td><td></td><td></td></tr>
</table>

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	**Principles of Petroleum Engineering**	**Module Delivery**	
Module Type	**Core**	☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	**PRE122**		
ECTS Credits	**5**		
SWL (hr/sem)	**125**		
Module Level	UGI	**Semester of Delivery**	Two
Administering Department	PRE	**College**	PMEUOM
Module Leader	Mahmood Salman Ahmed	**e-mail**	mahmood.salman@uomosul.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	01/06/2023	**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 Objectives أهداف المادة الدراسية	1. 1.To develop problem solving skills and understanding petroleum origin theories . 2. To understand chemical composition of petroleum. 3. This course deals with the basic concept of petroleum system. 4. To understand problems mud drilling. 5. To study physical properties of rocks.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how flow fluids in rocks. 2. List the various terms associated with petroleum. 3. Summarize what is meant by petroleum system. 4. Discuss the physical properties of the reservoir rocks. 5. Define the porosity and permeability of the rocks. 6. Identify the basic elements and processes of the petroleum system. 7. Discuss properties the drilling mud. 8. Explain the drilling engineering.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Petroleum Engineering ,petroleum geologist, Reservoir engineering ,Drilling engineers, Production engineering . [10 hrs] Origin of petroleum ,In organic theory , Organic theory, Chemical of petroleum. [10 hrs] Petroleum system, Element of petroleum system, processes of petroleum system . [10 hrs] Revision problem classes [8 hrs] Drilling rig components, Types and uses of drilling mud, Drilling problems and their treatments .[10 hrs]

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 types 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	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	5.13
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 #3 and #4
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Project/Lab.	1	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	Chemical composition of petroleum
Week 3	Petroleum system (elements + processes)
Week 4	Physical properties of reservoir rocks (porosity & classification of porosity)
Week 5	Physical properties of reservoir rocks (permeability & saturation)
Week 6	Physical properties of crude oil
Week 7	Physical properties of natural gas
Week 8	Exam 1
Week 9	Volumetric estimates & recoverable reserves
Week 10	Phase diagram & classification of petroleum reservoirs
Week 11	Classification of crude oil reservoirs
Week 12	Classification of natural gas reservoirs
Week 13	Drilling Engineering (Rotary drilling)
Week 14	Drilling Engineering (Casing + Cementing)
Week 15	Exam 2

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	

<table>
<tr><th colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</th></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Lectures of "Fundamental Of Petroleum Engineering" by Hamid M.F. and Suleiman W.R.W. ,University Technology Malaysia, Faculty of Petroleum &Renewable Engineering, Department of Petroleum Engineering.</td><td>Yes</td></tr>
<tr><td>Recommended Texts</td><td>Petroleum geology e. textbook , S.L. Bend 2008
Petroleum geology , F.K. North 1985
Applied subsurface geological mapping , Tearpock and Bischke 1991
Geology of petroleum , A.I. Levorsen , 1958
Introduction to petroleum engineering , John R. Fanchi and Richardl . Christiansen,2017
Elements of Petroleum Geology, Selley, R.C. and S.A. Sonnenberg (2015): Third Edition, San</td><td>No</td></tr>
<tr><td>Websites</td><td></td><td></td></tr>
</table>

<table>
<tr><th colspan="5">Grading Scheme
مخطط الدرجات</th></tr>
<tr><td>Group</td><td>Grade</td><td>التقدير</td><td>Marks %</td><td>Definition</td></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>
</table>

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

المؤسسة التعليمية	**جامعة الموصل**
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Computer applications in engineering/PRE212
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1- This course deals with Data Analysis and Visualization 2- MATLAB is widely used for modeling and simulating engineering systems. 3- engineers can use MATLAB to analyze and process signals, design filters, perform spectral analysis, and develop communication algorithms. 4- MATLAB is a powerful tool for data analysis and visualization. 5- MATLAB provides a comprehensive suite of tools for machine learning and deep learning applications. 6- MATLAB help to understand petroleum engineering by reservoir simulation
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Students will develop a solid understanding of the MATLAB programming language, including syntax, data types, variables, arrays, and control structures 2- They will be able to write and execute MATLAB code to solve engineering problems efficiently. 3- understanding the condition and loops 4- Students will learn how to import, and analyze engineering data using MATLAB

	5- Learners will acquire knowledge of MATLAB's numerical computation capabilities, including solving equations, numerical integration, optimization, and interpolation.
	6- Students will learn how to utilize MATLAB for analyzing well test data and interpreting reservoir properties.
Indicative Contents المحتويات الإرشادية	Introduction to MATLAB: MATLAB Basics [2 hrs], Command window and workspace [2 hrs], Branching Statements and Program Design [2 hrs] Loops and Vectorization [2 hrs] Defined Functions Control flow statements (if-else, loops) [2 hrs], for loops [2 hrs] , switch [2 hrs] Complex Numbers and 3D Plots [2 hrs], Matrix Operations [2 hrs], Sparse Arrays, Cell Arrays, and Structures [2 hrs] Input/Output Functions [2 hrs], Application about the numerical analysis [2 hrs] Image Processing [2 hrs], Geological Models and Grids [2 hrs], Simulation Basic [2 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Work on Real-World Projects: Apply MATLAB to real-world engineering problems or projects. This hands-on approach will help you develop practical skills and gain experience in using MATLAB for engineering applications. active Learning: Encourage students to actively engage with the material through problem-solving, discussions, and interactive activities. Provide opportunities for students to work on problems individually and in groups, promoting critical thinking and understanding of concepts Work on Real-World Projects: Apply MATLAB to real-world engineering problems or projects. This hands-on approach will help you develop practical skills and experience in using MATLAB for engineering applications. Problem-Solving Approach: Encourage students to approach problem-solving strategically, emphasizing the importance of planning, organizing, and reasoning through each step. Use of Resources: Utilize the textbook as a primary resource, complementing it with supplementary materials, including online resources, video tutorials, and practice exercises. Assessment and Feedback: Use a variety of assessment methods, including quizzes, tests, projects, and problem sets, to evaluate students' understanding of calculus concepts. Provide

timely and constructive feedback on students' work, highlighting areas of strength and areas for improvement.

Foster a collaborative learning environment by encouraging students to work together, discuss concepts, and explain ideas to their peers. Incorporate group activities, such as problem-solving sessions, group projects, and presentations, to promote teamwork and peer learning. Facilitate class discussions to encourage students to ask questions, share insights, and deepen their understanding through active participation.

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to MATLAB
Week 2	MATLAB Basics
Week 3	Branching Statements and Program Design
Week 4	Loops and Vectorization
Week 5	Defined Functions
Week 6	if-else, loops
Week 7	Mid-term Exam + For , switch
Week 8	Complex Numbers and 3D Plots
Week 9	Matrix Operations
Week 10	Sparse Arrays, Cell Arrays, and Structures
Week 11	Input/Output Functions
Week 12	Application about the numerical analysis
Week 13	Image Processing
Week 14	Geological Models and Grids
Week 15	Simulation Basic
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: ntroduction to MATLAB: Overview of MATLAB environment, basic syntax, and commands.
Week 2	Lab 2: Working with Variables: Creating and manipulating variables, data types, and arrays.
Week 3	Lab 3: Importing and Exporting Data: Loading data from external files, such as spreadsheets or text files.

Week 4	Lab 4: Control Flow and Loops: Using conditional statements (if-else) and loops (for, while) in MATLAB.
Week 5	Lab 5: Matrix Operations: Manipulating matrix, performing matrix arithmetic, and solving linear systems.
Week 6	Lab 6: Simulink Basics: Introduction to Simulink, creating and simulating dynamic systems.
Week 7	Lab 7: Case Study: Applying MATLAB to solve specific oil engineering problems

<div align="center">

Learning and Teaching Resources

مصادر التعلم والتدريس

</div>

	Text	Available in the Library?
Required Texts	MATLAB for Engineering Applications , William J. Palm III	No
Recommended Texts	MATLAB for Engineers , Holly Moore	No
Websites	https://www.mathworks.com/academia/courseware/teaching-first-year-engineering-with-matlab-and-simulink.html	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Fundamental of Reservoir Engineering II/PRE221
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The Program Educational Objectives have been formulated taking into account constituency needs and expectations, in order to provide students with an outstanding engineering education that allows them to achieve a fruitful and rewarding professional practice in a highly demanding workplace. Taking into account the needs and expectations of constituencies and considering the accomplishments that petroleum engineers are expected to attain a few years after graduation, the Program Educational Objectives have been defined so that the graduates of Petroleum Engineering: 1. Technical Competence Demonstrate a solid technical competence for the planning, exploration and drilling of oil and gas wells, as well as their production, transport and storage. 2. Adaptability and Achievement Work and interact at the different levels of an engineering project, attaining proposed goals, and advancing in their field of professional development. 3. Leadership Lead and proactively participate in multidisciplinary teams with an attitude toward the effective achievement of objectives.

	4. Professionalism Conduct themselves correctly respecting the standards and ethical principles of the profession, and projecting themselves as responsible citizens and professionals. 5. Continuing Education Develop a continuous learning and training, assimilating the changes and advances in the profession, and completing specialization.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The petroleum reservoir engineering program's student outcomes are shown below: **Outcome** 1 An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline. **Outcome** 2 An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline. **Outcome** 3 An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature. **Outcome** 4 An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes. **Outcome** 5 An ability to function effectively as a member as well as a leader on technical teams.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Rock properties Theory Introduction to Reservoir Rock[1 hrs] , Porosity[2 hrs], Saturation[2 hrs], Wettability[2 hrs], Surface and Interfacial Tension[2 hrs] , Capillary Pressure[2 hrs] , Leverett J-function[2 hrs] , Permeability[3 hrs], The Klinkenberg Effect[2 hrs], Rock Compressibility[2 hrs], Relative Permeability[3 hrs], Introduction to Reservoir Fluid Flow[3 hrs], Steady-State Flow[2 hrs], Reservoirs classification and Reservoirs conditions[2 hrs]. **[30 hrs]** . Part B - Tutorial Porosity[4 hrs], Saturation[3 hrs], Wettability[3 hrs], Capillary Pressure[3 hrs] , Leverett J-function[3 hrs] , Permeability[6 hrs], The Klinkenberg Effect[1 hrs], Rock Compressibility[3 hrs], Relative Permeability[4 hrs]. **[30 hrs]**

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	
	The Students will get the principles knowledge of essential subjects in petroleum reservoir Engineering and some details for the rock properties to the carbonate and clastic reservoir. The student will be able to identify the problems in the field and he will be able to solve it.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Reservoir Rock Properties
Week 2	Porosity
Week 3	Saturation
Week 4	Wettability
Week 5	Surface and Interfacial Tension
Week 6	Capillary Pressure
Week 7	Leverett J-function
Week 8	Permeability
Week 9	The Klinkenberg Effect
Week 10	Rock Compressibility
Week 11	Relative Permeability
Week 12	Introduction to Reservoir Fluid Flow
Week 13	Steady-State Flow
Week 14	Reservoirs classification
Week 15	Reservoirs conditions
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly tutorial. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	1: Porosity.
Week 2	2: Saturation.
Week 3	3:Wettability.
Week 4	4: Capillary Pressure.

Week 5	5: Permeability.
Week 6	6: Rock Compressibility.
Week 7	7: Relative Permeability.

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Petroleum Reservoir Engineering Handbook, Tarek Ahmed, 4th edition (2010)	Yes
Recommended Texts	Fundamental of petroleum reservoir , Nayef Alyafei, 2021	yes
Websites	https://www.slb.com/resource-library/article/2017/defining-reservoir-engineering	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

جامعة الموصل	1.المؤسسة التعليمية
قسم هندسة المكامن النفطية	2. القسم العلمي / المركز
Fundamentals of Petroleum Reservoir. Eng. I/214	3. اسم / رمز المقرر
حضوري	4. أشكال الحضور المتاحة
2024-2023	5. الفصل / السنة
75	6. عدد الساعات الدراسية (الكلي)
2023	7. تاريخ إعداد هذا الوصف

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course aims to 1. Learn the basics and equations of oil reservoirs. 2. Learn the ideal and real gas equations and differentiate between them. 3. Know the properties of natural gas, 4. Know the properties of crude oil. 5. Knowledge of phase behavior, knowledge of oil classification and reservoir classification
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After studying this study methodology, the student will have: 1. Learn the basics of oil reservoirs and their equations 2. Learn the difference between ideal and real gases and their calculation methods. 3. Learn the physical and chemical properties of natural gas and know how to extract it and include it in various mathematical equations. 4. Learn about the different properties of crude oil and their tables and shapes. 5. Knowledge of phase behavior (PVT), knowledge of different oil classifications, and classification of reservoirs according to regions and geological structures
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.

	Guide the student to: How to better acquire the information related to this course and use the charts and tables allocated for this, and how to choose the best methods to deal with each reservoir case or according to the type of oil or natural gas

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Encourage students' participation in classroom assignment, class discussion, class exercise, homework exercises, and answer review questions, all designed to develop a working knowledge of reservoir modeling. In addition, encourage students to visit several websites that improve their skills to use some reservoir modeling software.

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Basic Concepts and Equations, Introduction to Reservoir Engineering.
Week 2	Equation of State Ideal Gas Law
Week 3	Real Gas Law Van der Waals Equation
Week 4	Problems of CH1
Week 5	Natural Gas Properties
Week 6	Critical Temperature and Pressure, Single-Component Systems
Week 7	Two-Component Systems, Multicomponent Systems
Week 8	Principle of Corresponding States, Determination of Z-factor Value, Isothermal Gas Compressibility
Week 9	Crude Oil Properties
Week 10	Problems of CH2
Week 11	Phase Behavior, Classification of Reservoirs
Week 12	Phase Behavior and Pressure-Temperature Diagram
Week 13	Classification of Reservoirs
Week 14	Classification of Crude Oils
Week 15	Laboratory Analysis of Reservoir Fluids

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1- **Ahmed, T.,2019, "Reservoir Engineering Handbook", Gulf Professional Publishing.** 2- **Ahmed, T., 2016, "Equation of State and PVT Analysis Application for Improved Reservoir Modelling". Elsevier Inc, USA.**	No
Recommended Texts	1. **Nnaemeka Ezekwe, 2011, "Petroleum Reservoir Engineering Practice", Pearson Education, Inc., Boston.**	No

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Gravity prospecting/211**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

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 circuit theory through the application of techniques. 2. To understand density, gravity and anomaly from a given survey. 3. This course deals with the basic concept of gravity survey. 4. This is the basic subject for all gravity methods and their requirements. 5. To perform all required corrections and analysis. 6. To understand subsurface models and its importance in oil industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Delineate the general principles of geophysical methods 2. Determine the geophysical field operations 3. Recognize the basis of gravity laws. 4. Study of gravity measurements methods. 5. Identify the Principle of modern gravimeters 6. Describe the types of gravity corrections, temporal, and spatial. 7. Explain the types of gravity survey, land, airborne, ship. 8. Discuss the operations of gravity data analyses. 9. Discuss the various gravity separation methods .

	10. Interpret the produced anomaly according to the shape of subsurface model.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. The theoretical basis of gravity method- Gravitational force, gravitational acceleration, density variations of earth materials, Geiod and spheroid, simple model, development of gravity measurements, falling body measurement, pendulum measurement, mass and spring measurement. [15 hrs] Factors affect the gravitational acceleration- Gravity survey procedures, base station, Temporal corrections, drift correction, tidal correction, data reduction, spatial corrections, latitude correction, elevation correction, free air correction, bouguer correction, terrain correction. [15 hrs] The other types of gravity surveys- Airborne survey, procedures, corrections, data analyses, shipborne survey, procedures, corrections, data analyses. [10 hrs] Isolation of Gravity data – local and regional gravity anomaly, sources of gravity anomaly, methods of isolation, direct estimate, graphical estimate, mathematical estimates, moving average, function fitting, upward continuation, downward continuation, separation examples. [15 hrs] Interpretation of gravity data – Talwani method, Gravity anomaly over buried point mass, gravity anomaly over buried sphere, model indeterminacy, gravity anomaly over bodies with more complex shapes. [10 hrs] Isostasity – Isostatic theories, Pratt's theory, Airy's theory, Isostaic correction, compensation, under compensation, over compensation, uses of isostasity. [10 hrs]

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 types of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction : The general principles of geophysical methods
Week 2	Geophysical field operations
Week 3	The general basis of gravity method
Week 4	Absolute and relative gravity measurements; Gravimeters
Week 5	Land, airborne, and shipborne gravity surveys
Week 6	Various corrections for gravity data reduction – free air, and Bouguer corrections
Week 7	Terrain corrections
Week 8	Density estimates of rocks
Week 9	Regional and residual gravity separation methods; direct, graphical, and mathematical estimation methods
Week 10	Data enhancement techniques; upward continuation, function fitting, and moving average
Week 11	Interpretation of gravity data – Talwani methods
Week 12	Gravity anomaly over buried point mass, gravity anomaly over buried sphere
Week 13	Model indeterminacy, Ambiguity
Week 14	gravity anomaly over bodies with more complex shapes
Week 15	Isostasity – Isostatic theories, Isostaic correction, the principal of compensation
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 gravity acceleration of the earth
Week 2	Lab 2: Corrections of gravity data; drift and tidal
Week 3	Lab 3: Corrections of gravity data; free air, Bouguer
Week 4	Lab 4: Terrain correction
Week 5	Lab 5: graphical separation method
Week 6	Lab 6: gravity anomaly; profile, and map
Week 7	Lab 7: Interpretation of gravity models

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	An introduction to Geophysical Prospecting by Dobrin, M.B. McGraw Hill, New Delhi, 1984.	Yes
Recommended Texts	Exploration Geophysics - An Outline by Bhimasarikaram V.L.S., Association of Exploration Geophysicists, Osmania University, Hyderabad, 1990.	No
Websites	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/gravity-survey	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Numerical & Engineering Analysis /PRE223
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The curriculum of the engineering and numerical analyzes course aims to introduce the student to the skills of scientific mathematical foundations and to learn solutions to engineering problems using multiple numerical and engineering methods. The student also understands the mathematical theories and laws that enable the student to apply them in the fields of materials engineering, whether in engineering analyzes or other applications. As well as 1- Learn how to analyze engineering mathematical problems. 2- Learn to think about issues and write outputs. 3- Learn to spot and correct mistakes. 4- Familiarity with the basic concepts of engineering and numerical analyses.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	11. Introducing students to the skills of scientific mathematical foundations and learning solutions to engineering problems using multiple numerical and engineering methods. 12. The student's understanding of mathematical theories and laws that enable the student to apply them in the fields of materials engineering, whether in engineering analyzes or other applications. 13. Learn how to think about the programs used in engineering analysis. 14. The student learns a lot of important numerical applications related to the subject. 15. Enable students to write reports on topics related to engineering analytics.

	16. Enabling students to use the Internet to obtain important information. 17. Raise the student's self-confidence by linking the theoretical material with the practical reality. 18. Developing students' skills in how to deal with problem solving issues and how to deal with them. 19. Developing students' skills
Indicative Contents المحتويات الإرشادية	To study numerical and geometric analyses, it is divided into three hours per week as follows 1- Introduction to Matrices & Gauss Elimination Method (3hr) 2- Gauss Jordan Method & Matrix Inverse Method (3hr) 3- Laplace Transformations & Inverse of Laplace Transformations (3hr) 4- Solution of differential Eq. by Laplace (3hr) 5- Numerical solution of differential Eq. (3hr) 6- Fourier Series (3hr) 7- Fourier Series Expansion (3hr) 8- Solution of Partial differential Eq (3hr) 9- Numerical Differentiation (6hr) 10- Finite Difference Method (6hr) 11- Preparatory week before the final Exam (2hr)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1- The teacher prepares lectures on the subject in paper and electronic format and presents them to the students. 2- The teacher gives lectures in detail. 3- The teacher requests periodic reports and homework on the basic topics of the subject. 4- Daily discussion to find out the extent of students' comprehension of the material and to develop an evaluation of the daily contributions. 5- Daily exams with a variety of short scientific questions to understand the extent of their understanding of the subject. 6- Giving part of the grade for each chapter for homework. 7- Daily exams (Quiz) and monthly exams for the curriculum and the final exam 8- Encouraging the student to comprehend the objective of studying the subject in general. 9- Urging the student to comprehend and think about mathematical laws. 10- Encourage the student to think about how to develop oneself in the field of engineering analytics. 11- Making the student able to deal with the multiple methods in analyzes and how to use solutions

Delivery Plan (Weekly Syllabus)

<div dir="rtl">المنهاج الاسبوعي النظري</div>

	Material Covered
Week 1	Introduction to Matrices & Gauss Elimination Method
Week 2	Gauss Jordan Method & Matrix Inverse Method
Week 3	Gauss Jordan Method & Matrix Inverse Method
Week 4	Laplace Transformations & Quiz
Week 5	Inverse of Laplace Transformations
Week 6	Solution of differential Eq. by Laplace
Week 7	Numerical solution of differential Eq.
Week 8	Fourier Series & Quiz
Week 9	Fourier Series Expansion
Week 10	Solution of Partial differential Eq
Week 11	Solution of Partial differential Eq.
Week 12	Numerical Differentiation & Quiz
Week 13	Numerical Differentiation
Week 14	Finite Difference Method
Week 15	Finite Difference Method
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

<div dir="rtl">مصادر التعلم والتدريس</div>

	Text	Available in the Library?
Required Texts	Advanced Engineering Mathematics by Erwin Kreyszig, 10th Ed., 2011. <div dir="rtl">التحليل الهندسي والعددي التطبيقي، حسن مجيد الدلفي و محمود عطا هللا، الجامعة التكنلوجية – جمهورية العراق بغداد، الطبعة الأولى 1999</div>	Yes
Recommended Texts	Chapra, S. C. and Canale, R. P. " Numerical methods for Engineers", 6th Ed., McGraw Hill, (2010)	No
Websites	http://www.personal.soton.ac.uk/jav/soton/HELM/workbooks/workbook_30/30_3_lu_dec omposition.pdf. https://www3.nd.edu/~zxu2/acms40390F12/Lec-7.3.pdf https://www.youtube.com/watch?v=F6J3ZmXkMj0 https://www.youtube.com/watch?v=kbWS0JNLTVc	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Petroleum Geology/213
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1-This module is designed to describe the different elements and processes that constitute the petroleum system. 2-The module presents the origin, types and characteristics of source rocks, too. 3-It contains the reservoir rocks and their properties to evaluate the reservoir potential prior to exploration and development of petroleum. 4-The hydrocarbon migration and accumulation and entrapment style are also included in this course. 5- Main hydrocarbon provinces and selected case study will be presented, as well.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-understand the history of petroleum and hypothesis of generation. 2-understand the oil industry, exploration tools, exporting and importing countries . 3- explain the dynamics of a system to generate and accumulate oil and gas. 4 - evaluate source rock potential and hydrocarbon potentiality. 5-characterise reservoir rocks, calculate porosity, permeability and saturation. 6- identify different types of oil traps and how they are formed. 7-draw the petroleum system event chart. 8-visualise the petroleum system in order to identify migration pathways of hydrocarbon and predict the most suitable traps for accumulation. 9- appraise the hydrocarbon potentiality and calculate the reserve in place.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Circuit Theory Petroleum system analysis, the role of organic matter in source rocks, The conditions of diagenesis and catagenesis for source rock maturation , Generation and migration of hydrocarbons, the rock-fluid relationship Seal rock, oil traps and reservoir characterization.[15hrs] Introduction to petroleum geology .[10 hrs] What is petroleum geology ,Origin of petroleum ,In organic theory , Organic theory, Chemical of petroleum. [10 hrs] Petroleum system, Element of petroleum system, Source rocks, Reservoir rocks , Seal rock ,processes of petroleum system, Generation of petroleum, Generation and accumulation of petroleum, . [10 hrs] Hydrocarbon traps, Reservoir condition [8 hrs] Chemical composition of oil and gass.[10 hrs] Exploring and production of petroleum, Drilling rig components, Types and uses of drilling mud, Drilling problems and their treatments .[15 hrs] Part B - Introduction to contour maps, contour map part 1, Contour maps part 2 .[15 hrs] Subsurface maps Structural maps part 1, Structural maps part 2. [15 hrs] Isopach maps, Lihofacies maps, Geological cross section, Isolith maps, Unconformity 1, Unconformity 2 .[15 hrs]

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 types of simple experiments involving some sampling activities that are interesting to the students.

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Introduction to petroleum geology
Week 2	What is petroleum geology
Week 3	Chemical composition of oil and gass
Week 4	Origin of oil and gas
Week 5	Natural cracking
Week 6	Generation of petroleum
Week 7	Source rocks
Week 8	Reservoir rocks
Week 9	Seal rock
Week 10	Generation and accumulation of petroleum
Week 11	Exam
Week 12	Hydrocarbon traps
Week 13	Reservoir condition
Week 14	Exploring and production of petroleum
Week 15	Petroleum geology of Iraq

	Delivery Plan (Weekly Lab. Syllabus)
	المنهاج الاسبوعي للمختبر
	Material Covered
Week 1	Introduction to contour maps
Week 2	contour map part 1
Week 3	Contour maps part 2
Week 4	Subsurface maps
Week 5	Structural maps part 1
Week 6	Structural maps part 1
Week 7	Exam 1
Week 8	Isopach maps
Week 9	Lihofacies maps
Week 10	Geological cross section
Week 11	Geological correlation

Week 12	Isolith maps
Week 13	Unconformity 1
Week 14	Unconformity 2
Week 15	Mid exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Petroleum geology e. textbook , S.L. Bend 2008 Petroleum geology , F.K. North 1985	Yes
Recommended Texts	Elements of Petroleum Geology, Selley, R.C. and S.A. Sonnenberg (2015): Third Edition, San	YES
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Serving Engineering/218**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	7. Principles of Surveying Engineering 8. Surveying devices, theodolites, leveling devices, and the complete station 9. Projection, triangulation 10. Methods for calculating areas and volumes
Indicative Contents المحتويات الإرشادية	The student of the Engineering needs to study surveying for six hours per week divided into three practical hours and the same theoretical hours, as a curriculum. The study is as follows: A- Curriculum, sources, definition of surveying, its types, branches and how to develop it, units of measurement, drawing scale, location accuracy, basic principles of surveying, tape surveying, errors, their types and sources (6 hr) B- Methods of measuring horizontal distances, electronic measurements of distances, leveling, types of leveling device (level) (8hr) C- Leveling methods, errors in the leveling process, longitudinal sections, methods of making contour maps (6hr) D- Regular areas, irregular areas, cross-sectional areas, volumes and earthworks (6hr) E- Daily and quarterly exams (6hr)
Module Learning Outcomes	A- Thinking Skills 1. The Ability to Interact with Sources and References 2. The Ability to Identify Engineering Problems

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مخرجات التعلم للمادة الدراسية	3. The Ability to Correctly Evaluate
	4. The Ability to Submit Proposals and Solve Problems
	5. The Ability to Conclude and Compare
	B- General Skills and transferable (other skills related to employability and personal development).
	1. Ability to deal with work environment problems
	2. Correct discrimination of problems and the ability to find solutions to them
	3. Evaluation, use and improvement of work mechanisms
	4. Determining appropriate work standards
	5. Developing a spirit of cooperation and teamwork as one team

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Teaching and Learning Methods
	1. Lectures
	2. Worksheets
	3. Online Studies
	4. Laboratory Activities
	5. Scientific Visits
	B. Assessment Methods
	1 Midterm Exam
	2 Activity
	3 Practical Test
	4 Oral Test
	5 Final Exam

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Engineering survey / introduction and definitions
Week 2	Tape scanning
Week 3	Directions - Types of displaced polygons - Angles of deviation - Interior angles
Week 4	Directions - Types of displaced polygons - Angles of deviation - Interior angles
Week 5	Leveling - flat surface - vertical line - flat line Leveling devices and their types
Week 6	Investigative Settlement - Settlement Device - Mutual Settlement
Week 7	Investigative Settlement - Settlement Device - Mutual Settlement
Week 8	Errors in the settlement process - errors - and accuracy

Week 9	Longitudinal sections
Week 10	cross sections
Week 11	Errors in working with theodolite device
Week 12	Calculating coordinates for area polygons
Week 13	Calculating coordinates for area polygons
Week 14	Indirect methods of measuring distances
Week 15	contour lines
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Tape scanning
Week 2	Directions - Types of displaced polygons - Angles of deviation - Interior angles
Week 3	Leveling - flat surface - vertical line - flat line Leveling devices and their types
Week 4	Investigative Settlement - Settlement Device - Mutual Settlement
Week 5	Errors in the settlement process - errors - and accuracy
Week 6	Longitudinal sections
Week 7	cross sections

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Engineering Survey / m. Yassin Obaid Ahmed - Ministry of Higher Education and Scientific Research	Yes
Recommended Texts	1- Text book of surveying / S.K.Husain M.S.Naga Raj. 2- Elementary Surveying an introduction (Geometrics by Charles D. Ghilani . Paul R. Wolf/Thirteen Edition 2012 3- Springer Handbook of Geographic Information Kresse Danko (Eds)and SpringerVerlag Berlin Heidelberg 2012	No
Websites	View scientific websites and training/application videos to view recent developments in the prescribed material.	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Static Fluid Mechanics/217
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	90
تاريخ إعداد هذا الوصف	2023

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

Module Objectives
أهداف المادة الدراسية
	This course deals with the static fluid mechanics, and it meets the following goals
	1. To introduce the concepts of fundamental static fluid mechanics.
	2. To elaboration the characteristics of fluid flow in terms of definition, derivation, equations, and applications.
	3. To determine the dimensions and units of physical quantities in fluid mechanics.
	4. To understanding the theoretical and mathematical concepts of static fluid issues and develop problem solving skills in class and lab.
	5. To identify Pressure at a Point (Pascal's law)
	6. To understand the pressure variation in a fluid at rest,
	   a) Incompressible Fluid
	   b) Compressible Fluid
	7. To recognize the hydrostatic force of fluid static on a plane surface and curved surface.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing those course, student should be able to: 1. Determine the dimensions and units of physical quantities. 2. Identify the key fluid properties used in the analysis of fluid behavior. 3. Calculate common fluid properties given appropriate information. 4. Explain the effects of fluid compressibility. 5. Use the concepts of viscosity, vapor pressure, and surface tension. 6. Determine the pressure at various locations in a fluid at rest.

	7. Explain the concept of manometers and apply appropriate equations to determine pressures. 8. Calculate the hydrostatic pressure force on a plane or curved submerged surface.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Fluid Mechanics and its Characteristic</u> Definition of fluid mechanics and its type and characteristic are explained in this part. Dimensions (MLT and FLT system), Dimensional Homogeneity (the dimensions of the left side of the equation must be the same as those on the right side), Two systems of units continue to be used throughout most of the text: the International System (SI) of Units (newtons, kilograms, meters, and seconds) and the British Gravitational System (BG) (pounds, slugs, feet, and seconds). Measures of Fluid Mass and Weight, density, specific weight, specific gravity, Ideal gas law. [10 hrs] Viscosity, because the properties are not sufficient to uniquely characterize how fluids behave since two fluids such as water and oil can have approximately the same value of density but behave quite differently when flowing. Definition of Newtonian fluid, non-Newtonian fluid, Bingham plastic. Compressibility of Fluids which include: Bulk Modulus, which shown the relationship between change in volume (density) of a given mass of the fluid be changed by change in pressure. Compression and Expansion of Gases. [6 hrs] Vapor pressure, it is common observation that liquids such as water and gasoline will evaporate if they are simply placed in a container open to the atmosphere. And the surface tension which is shown the relationship between interface between a liquid and a gas. [6 hrs] <u>Part B – Fluid Statics</u> Pressure at point, the pressure at a point in a fluid at rest, or in motion, is independent of direction as long as there are no shearing stresses present. This important result is known as Pascal's law. [4 hrs] Pressure Variation in a Fluid at Rest, Incompressible Fluid which is a fluid with constant density and compressible fluid which is the fluid with significant change in density under change in pressure like gases. Pressure types such as absolute pressure, gage pressure, vacuum pressure, and atmospheric pressure and its measurements. Manometers like piezometer and other instruments to measure the pressure, more over Mechanical and Electronic Pressure-Measuring Devices explain with details and mathematical equations. [10 hrs] Hydrostatic Force on a Plane Surface and Curved Surface, When a surface is submerged in a fluid, forces develop on the surface due to the fluid. The determination of these forces is important in the design of storage tanks, ships, pipes, dams, and other hydraulic structures. [12 hrs]

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 types of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction – Characteristics of fluid.
Week 2	Dimensions, Dimensional Homogeneity, and Units. System of units.
Week 3	Measures of Fluid Mass and Weight. Density, Specific weight, Specific gravity.
Week 4	Ideal gaze law. Exercises.
Week 5	Viscosity, compressibility of fluid: (a) Bulk Modulus. (b) Compression and Expansion of Gases.
Week 6	Vapor pressure, Surface tension.
Week 7	Mid-term Exam + Fluids in the news
Week 8	Fluid statics. Pressure at a Point (Pascal's law)
Week 9	Pressure Variation in a Fluid at Rest 　　(a) Incompressible Fluid. 　　(b) Compressible Fluid Standard Atmosphere
Week 10	Measurement of Pressure
Week 11	Manometry 　　(a) Piezometer Tube. 　　(b) U-Tube Manometer. 　　(c) Inclined-Tube Manometer
Week 12	Mechanical and Electronic Pressure-Measuring Devices
Week 13	Hydrostatic Force on a Plane Surface. Pressure Prism.
Week 14	Hydrostatic Force on a Curved Surface.
Week 15	Buoyancy, Flotation, and Stability, Archimedes' Principle, Stability
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: How to write reports and draw curves.
Week 2	Lab 2: Determination Center of Pressure on a Submerged Plane Surface (Group 1).
Week 3	Lab 3: Determination Center of Pressure on a Submerged Plane Surface (Group 2).

Week 4	Lab 4: Measurement Impact of Jet on Plate (Group 1).
Week 5	Lab 5: Measurement Impact of Jet on Plate (Group 2).

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Fluid Mechanics. Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch, and Alric P. Rothmayer. ISBN 978-1-118-11613-5 (Main Book) ISBN 978-1-118-39971-2 (Binder-Ready Version) Printed in the United States of America	EBook
Recommended Texts	Fluid Mechanics By Frank M. White	EBook
Websites		

MODULE DESCRIPTION

وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Strength of Materials/224
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	11. Understanding the conditions of equilibrium between the external forces and reactions on a member. 12. Understanding the relationships between strains (deformation) in a member and stresses (internal forces) producing them. 13. Understanding the conditions that can lead to failure in structural members and machine elements. 14. Analysis to determine the limiting loads that a member can stand before failure or excessive deformation occurs. 15. Understand the classification of materials based on ductility or brittleness. 16. Describe types of beams in their loading conditions. 17. Calculate the shear force required in causing a failure of a loaded beam. 18. Determine the location for bending and the maximum bending moment possible in a particular loading condition. 19. Analysis any form of loaded beams and draw the shear and bending diagrams. 20. Establish the effect of torque on a rotating shaft.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students who successfully complete this course will have demonstrated an ability to: 1. Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials. 2. Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings. 3. Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading.

	4. Determine and illustrate principal stresses, maximum shearing stress, and the stresses acting on a structural member. 5. Design simple bars, beams, and circular shafts for allowable stresses and loads. 6. Demonstrate competence in problem identification, formulation and solution, and critical thinking.
Indicative Contents المحتويات الإرشادية	Revise the cross-section properties; general internal forces. [5 hrs.] Normal stress and strain application to the analysis of simple structures; stresses on an oblique plane under axial loading and moment, Normal stresses in elastic bodies for heterogeneous and composite symmetrical and unsymmetrical sections for eccentric axial loading. [10 hrs.] Shear stress and strain ,Shear stresses due to direct and flexural shear. Determination of shear stresses due to shearing force; Transverse loading: Shear flow; shear stresses; stresses under combined loading. Determination of shear stresses on sections and bolts due to torsional. Determination of combined stresses; Principal stresses; maximum shearing stress. [12 hrs.] Bending stresss and Torsional loading of shafts. [10 hrs.]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	- Provision of detailed explanation in class on each topic. - Provision of adequate illustration on the board. - Making lecturing periods interactive. - Giving the students class work during the lecture period. - Giving take-home assignments at the end of each lecture. - Solving practical questions.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to mechanics of materials
Week 2	Tension, Compression, and Shear.
Week 3	Beams, shear force and bending moment equations.
Week 4	Shear Forces and Bending Moments diagrams
Week 5	Stresses in Beams
Week 6	Elongation, stress and strain for axial loads.
Week 7	Strain
Week 8	Strain transformation plane strain

Week 9	Bending stresses of beams.
Week 10	Bending stresses of composite sections.
Week 11	Shear stress in beams.
Week 12	Shear stress in bolt.
Week 13	Torsion
Week 14	Torsional deformations
Week 15	Statically Indeterminate Beams.
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Mechanics of materials, sixth edition, Ferdinand P. Beer • Mechanics of materials:an integrated learning system,Philpot • Strength of Materials 4th Ed. by Ferdinand L. Singer	Yes
Recommended Texts		No
Websites	https://www.google.com/search?q=strength+of+materials+books&sourceid=chrome&ie=UTF-8	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

جامعة الموصل	8. المؤسسة التعليمية
قسم هندسة المكامن النفطية	9. القسم العلمي / المركز
Thermodynamic/223	10. اسم / رمز المقرر
حضوري	11. أشكال الحضور المتاحة
2023-2024	12. الفصل / السنة
45	13. عدد الساعات الدراسية (الكلي)
2023	14. تاريخ إعداد هذا الوصف

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	21. To develop solving skills and an understanding of thermodynamics through theory studies, and experimental applications. 22. To understand the relation of volumes, pressures, and temperatures during different states and procedures. 23. This course deals with the basic concept of thermodynamics. 24. It deals with energy power plants and how to calculate energy. 25. To understand ideal gas law and state equations problems. 26. To understand the pure statement equation and case analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Recognize how thermodynamics is a core subject in many fields. 2. Learn how to calculate the pressure, temperature, and volume and their related quantities. 3. Understand what is meant by ideal gas laws. 4. Discuss the effects of heat/cold reactions on the thermodynamic process. 5. list the energy forms and their governing equations 6. Describe the power plants, energy cycles, and fuel operations. 7. Define the first law of thermodynamics. 8. Identify the dryness fraction of the pure substance elements and their applications. 9. Define the second law of thermodynamics. 10. Discuss the operations of the Carnot engine and its cycle

	11. Discuss the operations of heat engines, pumps, and refrigerator engines.

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module; 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, the displaying of industrial reportages, and alternative quizzes.

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction, Concept, Definitions, Dimensions & Units, Pressure, and Temperature, and Problems
Week 2	Thermodynamic Systems, Perfect Gas Law, Equation of State
Week 3	Equation of state (Boyl's Law, Charl's Law aAnd Gay-Lusac Law) and Problems
Week 4	Characteristic Gas Equation, specific volume, and molecular weight, and Problems
Week 5	Forms of Energy
Week 6	Properties of a Pure Substance
Week 7	First Law Of Thermodynamic
Week 8	Phases and Their Equilibria
Week 9	Second Law Of Thermodynamic
Week 10	The van der Waals Equation
Week 11	Structure of Thermodynamic Theories
Week 12	Thermodynamic Potentials and Maxwell Relations
Week 13	Dilute Solutions
Week 14	The Clapeyron Equation
Week 15	Semester exam
Week 16	The preparatory week before the Final Exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- Fundamentals of Engineering Thermodynamics; michael j. moran, el at. - Fundamentals of classical Thermodynamics; Gordon John Van Wylen - Engineering Thermodynamics: Work and Heat Transfer; G. F. C. Rogers and Y. R. Mayhew - Applied Thermodynamics for Engineering Technologists (5th Edition);T.D. Eastop , A. Mcconkey	Yes
Recommended Texts	The Principles of Thermodynamics, (N. D. Hari Dass)	No
Websites	https://www.coursera.org/search?query=THERMODYNAMIC&index=prod_all_launched_products_term_optimization&topic=Physical%20Science%20and%20Engineering&productDifficultyLevel=Beginner	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Applied Petroleum Reservoir Engineering I
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	Identify petroleum which are useful in petroleum industry. This course deals with study of Reservoir Rock Properties and Crude Oil, type of oil reservoirs, determination of the physical properties of reservoirs and reservoir fluids, reservoir pressure and distribution of fluid, classification of reservoir fluids behavior, material balance equation and the drive indices.
Module Learning Outcomes	1- Developing the student's ability to deal with technical means related to reservoir engineering. 2- Developing the student's ability to understand the behavior of reservoir fluids. 3- Developing the student's ability to deal with the physics of fluids and reservoirs alike. 4- Developing the student's ability to dialogue and discussion. 5- Developing the student's ability to understand and apply mathematical equations, graphs and Software related to the oil industry. 6- Learn how to deal with pressure distribution in reservoir. 7- Learn how to calculate volume of oil in place by multiple models for different flow systems.
Indicative Contents	**Part A – Theoretical lectures** Introduction of petroleum, properties of reservoir fluids, properties of oil, properties of gas[**8 hours**], the most important parameters of reservoir calculations and reservoir terminology, reservoir oil and reservoir rocks, the most important terms of the oil

industry[**4 hours**], such as porosity and permeability and their calculations, how to calculate the permeability of gaseous reservoirs, the relationship between porosity and permeability [**8 hours**], reservoir pressure and distribution of fluids[**2 hours**]. Material balance equation and productivity index, and material balance equation as a straight line[**8 hours**].

Part B – Tutorial

Learning and Teaching Strategies

Strategies	Expanding students' perceptions about this science and its contents it includes that help in reservoir engineering understand , petrophysical properties, . In addition to the use of different skills in calculation of oil volume, distinguishing and classification the types of reservoir fluids through observations of their behavior. This will be achieved through lectures, and interactive tutorials that are interesting to the students.

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Reservoir Rock Properties
Week 2	Reservoir Fluid Properties • Natural gas properties
Week 3	• Crude Oil Properties
Week 4	Total Formation Volume Factor
Week 5	Petroleum Reservoirs and Reservoir Rocks
Week 6	Porosity Ø and An averaging techniques for porosity calculations
Week 7	Permeability K
Week 8	Permeability For radial flow of fluids into a wellbore
Week 9	The Klinkenberg Effect
Week 10	Porosity and permeability relationship, Pressure Potential & Pressure Gradient in Static Fluid Columns.
Week 11	Classification of reservoir fluids behavior.
Week 12	Oil Recovery Methods, Reservoir Primary Recovery Mechanisms.
Week 13	Material Balance Equation.

Week 14	The Drive Indices.
Week 15	Material Balance Equation as a Straight Line.

Delivery Plan (Weekly Tut. Syllabus)

	Material Covered
Week 1	Tut 1: Reservoir gas properties calculations.
Week 2	Tut 2: Reservoir oil properties calculations.
Week 3	Tut 3: Calculations of the petrophysical properties of reservoir rocks (porosity).
Week 4	Tut 4: Calculations of the petrophysical properties of reservoir rocks (permeability).
Week 5	Tut 5: A absolute and effective permeabilities calculations.
Week 6	Tut 6: Calculate the pressure distribution in a reservoir.
Week 7	Tut 7: Calculations of overburden gradient formations pressure.
Week 8	Tut 8:. Calculations of the initial volumes of oil and gas in the reservoir.
Week 9	Tut 9: Calculate the initial oil-in-place, Cumulative water influx and Net water influx by MBE.
Week10	Tut 10: Determine expansion of the various zones, total underground withdrawal, volume of free gas in the reservoir, aquifer influx, indicate the least and most active drive mechanism.
Week 11	Tut 11: Calculate the percent contributions of the various fluids to the underground hydrocarbon production .
Week 12	Tut 12: Calculate the initial oil in place by using the MBE and compare with the volumetric estimate of N.
Week 13	Tut 13: Calculate the initial oil in place by using the MBE and compare with the volumetric estimate of N for volumetric undersaturated reservoir.
Week 14	Tut 14: Calculate the initial oil-in-place by using the MBE and compare with the volumetric estimate of N for volumetric saturated-oil reservoirs.
Week 15	Tut 15: A review of application examples.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Reservoir Engineering Handbook, Tarek Ahmed, 4th edition (2010) Reservoir Engineering Fundamentals and Applications Sylvester Okotie Department of Petroleum Engineering Federal University of Petroleum Resources Effurun, Nigeria Bibobra Ikporo Department of Chemical & Petroleum Engineering Niger Delta University Yenagoa, Nigeria (2019)	Yes No
Recommended Texts	fundamentals of reservoir engineering LP. DAKE Senior Lecturer in Reservoir Engineering, Shell International Petroleum Maatschappij B. V., The Hague, The Netherlands	Yes
Websites	https://doi.org/10.1007/978-3-030-02393-5	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Drilling Engineering I**
أشكال الحضور المتاحة	
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	45
تاريخ إعداد هذا الوصف	2023

<table>
<tr><th colspan="2" style="text-align:center">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>**Module Objectives**
أهداف المادة الدراسية</td><td>1. Understanding the basics of drilling operations, including drilling fluids, drill bits, and drilling rig components.

2. Learning how to design and implement drilling programs for various types of wells, such as oil/gas wells.

3. Gaining knowledge on drilling safety practices and how to handle emergency situations during drilling operations.

4. Familiarizing with drilling optimization techniques, such as directional drilling, hydraulics optimization, and bit selection.</td></tr>
<tr><td>**Module Learning Outcomes**</td><td>Important: Write a Learning Outcomes, better to be equal to the number of study weeks.

1. Understanding the basic concepts of drilling engineering, including drilling fluids, drill bits, and drilling operations.</td></tr>
</table>

مخرجات التعلم للمادة الدراسية	2. Analyzing drilling problems and developing solutions to overcome them.
	3. Understanding the principles of wellbore stability and its impact on drilling operations.
	4. Analyzing the geological formations and selecting the appropriate drilling methods.
	5. Evaluating drilling economics and the impact on drilling operations.
	6. Developing an understanding of safety practices and environmental concerns in drilling operations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Drilling Engineering 2. Well planning and design 3. Drilling fluids and their properties 4. Drill bits and drilling mechanics 5. Directional drilling 6. Casing and cementing 7. Well control and blowout prevention 8. Drilling problems and troubleshooting 9. Drilling rig components and systems 10. Health, safety, and environmental considerations in drilling operations These are just a few of the topics that may be covered in a Drilling Engineering course.

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 types of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to drilling, Classification of drilling operations, well planning and design
Week 2	Properties and functions of drilling fluid, Types and properties of clay in water
Week 3	types of drilling fluids
Week 4	Drilling hazards dependent on mud control, drilling mud calculations

Week 5	Drilling methods (cable tool drilling, rotary drilling)
Week 6	Drilling rig components and systems, Basic component of rotary drilling equipment
Week 7	Drilling string and accessories
Week 8	Types of bits, drill bit design and selection
Week 9	Casing of oil wells, Functions of casing
Week 10	Types of casing. Casing Strings
Week 11	Parameters of casing design, Selection of casing and bit types
Week 12	Cementing of oil wells Classification and properties of cements
Week 13	Classification of cementing operations
Week 14	Cementing equipment
Week 15	Methods and calculations of cementing
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Oil well Drilling Engineering Principles And Practice. H. Rabia	Yes
Recommended Texts		No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Drilling Engineering II**
أشكال الحضور المتاحة	
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	45
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Understanding the basics of drilling operations, including drilling fluids, drill bits, and drilling rig components. 2. Learning how to design and implement drilling programs for various types of wells, such as oil/gas wells. 3. Gaining knowledge on drilling safety practices and how to handle emergency situations during drilling operations. 4. Familiarizing with drilling optimization techniques, such as directional drilling, hydraulics optimization, and bit selection.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write a Learning Outcomes, better to be equal to the number of study weeks. 1. Understanding the basic concepts of drilling engineering, including drilling fluids, drill bits, and drilling operations. 2. Analyzing drilling problems and developing solutions to overcome them. 3. Understanding the principles of wellbore stability and its impact on drilling operations.

	4. Analyzing the geological formations and selecting the appropriate drilling methods.
	5. Evaluating drilling economics and the impact on drilling operations.
	6. Developing an understanding of safety practices and environmental concerns in drilling operations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to Drilling Engineering 2. Well planning and design 3. Drilling fluids and their properties 4. Drill bits and drilling mechanics 5. Directional drilling 6. Casing and cementing 7. Well control and blowout prevention 8. Drilling problems and troubleshooting 9. Drilling rig components and systems 10. Health, safety, and environmental considerations in drilling operations These are just a few of the topics that may be covered in a Drilling Engineering course.

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 types of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered

Week 1	Hydraulics of primary cementing operations
Week 2	Factors affecting drilling rate (effect of pressure, effect of physical properties of drilling mud, effect of weight on bit and rotary speed, economical effect)
Week 3	Directional Drilling, Directional Drilling Applications
Week 4	Factor affecting hole inclination of directional wells
Week 5	Non Petroleum Applications of Directional Drilling
Week 6	Definitions in Directional Drilling, Types of Profile in Directional Drilling
Week 7	Methods of calculations of directional wells
Week 8	Horizontal drilling, Types of Horizontal drilling
Week 9	Air Drilling
Week 10	Design of air drilling operations
Week 11	Drilling Problems and its Solution (Part 1)
Week 12	Drilling Problems and its Solution (Part 2)
Week 13	Drilling Problems and its Solution (Part 3)
Week 14	Well Completion Techniques
Week 15	Formation pore pressure and fracture resistance
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Oil well Drilling Engineering Principles And Practice. H. Rabia	Yes
Recommended Texts		No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	PRE322/Formation Evaluation
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. To identify main methods that evaluate rocks and fluid properties of reservoirs. 2. To learn about the methods of evaluation during drilling using Mud logging (Surface logging). 3. To show basic principles of coring and core methods in evaluate and estimate the petrophysical properties of reservoir. 4. Provide solid knowledge to interpret well logs to in order to make decisions related to well completion, field development etc. 5. This course provide the methods that estimate the reservoir parameters using well logs such as lithology, borehole condition, porosity, permeability, fluid saturations (reservoir characterization). 6. To identify shape and size of the reservoir structure. 7. To evaluate type of rocks as a reservoir or non-reservoir rocks, and identification of type and locates of fluids in the formations.
Module Learning Outcomes	1. Have an understanding of the fundamental concepts of main methods for formation evaluation. 2. Early recognize the presence of oil during drilling from the drill cuttings and drilling fluid.

مخرجات التعلم للمادة الدراسية	3. Describe geological and engineering properties from core analysis. 4. Recognize type of porosity in sedimentary rocks. 5. Calculate total and effective porosity, in addition to secondary porosity using conventional well logs. 6. Describe the vertical and lateral extent of the reservoir. 7. Distinguish between hydrocarbons and water filling the pores, hence calculate water saturation in reservoir rocks. 8. Know the vertical and lateral extent of the reservoir. 9. Subdivide the formation according to fluid content. 10. Estimate the main petrophysical properties of the reservoir as porosity, permeability, and fluid saturation. 11. Interpret different wire-line log data by cross-plotting
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A – Mud Logging Method** Introduction of formation evaluation, Mud Logging definition and the processes that related with it: Rate of Penetration, Gas Detection Collecting Samples and Show Evaluation. [15 hrs] **Part B – Coring Method** Coring process definition, coring methods, coring technique, core analysis methods. [10 hrs] **Part C – Well Logging Method** Well logging definition, porosity types, types of porosity logs, application of the porosity logs [15 hrs] Correction the porosity that estimated from the three logs (Neutron, Density, and Sonic) from volume of shale to find the effective porosity. [15 hrs] Using several Cross Plots Schlumberger Charts for porosity and Lithological Identification. [10 hrs] Estimation the Rw, water saturation, hydrocarbon saturation, bulk volume of water, residual oil saturation and moveable oil saturation. [15 hrs] Practice using NeuraLog software [15 hrs] Practice using Interactive software. [15 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	
	Encourage students' participation in classroom assignment, class discussion, class exercise, homework exercises, and answer review questions, all designed to develop a working knowledge of Formation Evaluation and prepare for the Evaluation Exercises. In addition, encourage students to visit several websites that improve their skills to use some petrophysical software.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of formation evaluation
Week 2	Mud Logging (Introduction)
Week 3	Rate of Penetration, Gas Detection
Week 4	Collecting Samples and Show Evaluation
Week 5	Cores and Core Analysis
Week 6	Well Logging (Introduction)
Week 7	Midterm Exam
Week 8	Porosity Types
Week 9	Porosity Logs (Application of Density Log)
Week 10	Application of Neutron Log
Week 11	Application of Sonic log
Week 12	Cross Plots for porosity and Lithological Identification
Week 13	Evaluation by Resistivity Logs
Week 14	Using NeuraLog software

Week 15	Using IP Software
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Calculation of the Rate of Penetration
Week 2	Lab 2: Estimation of the porosity and permeability from core data.
Week 3	Lab 3: Calculation of the total porosity from neutron log
Week 4	Lab 4: Calculation of the total porosity from Density log
Week 5	Lab 5: Calculation of the effective porosity from neutron and density logs
Week 6	Lab 6: Calculation of the primary (matrix) and secondary porosity from sonic log
Week 7	Lab 7: Estimate the lithology from cross plot technique
Week 8	Lab 8: Estimate fluid volumes (BVW, ROS, and MOS).
Week 9	Lab 9: NeuraLog applications
Week 10	Lab 10: Interactive Petrophysics applications.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1- Open-hole Log Analysis and Formation Evaluation by Richard M. Bateman, 2012. 2- Formation Evaluation with Pre-Digital Well Logs, by Richard M. Bateman, 2020. 3- Well Logging and Formation Evaluation, by Toby Darling, 2005. 4- The Expanding Role of Mud Logging, by Ablard, 2012. Oilfield Review	No

Recommended Texts	Schlumberger Log Interpretation, Principles/Applications, 1989 Schlumberger Log Interpretation Charts, 2009.	No
Websites	http://www.slb.com https://www.spec2000.net/index.htm https://www.youtube.com/watch?v=Sy3QBs9dJfo&list=PLOQDWHZ5FHVP2vJG0Cg91uPlWPtr3pgd-	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Petroleum Production Engineering 2/PRE 319**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	45
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

3 Module Objectives أهداف المادة الدراسية	1- This course deal with all activity of product engineering starting from the end of oil well completion to the end of all the local treatment of product crude oil, that will be ready to be storage or exported . 2- To illustrated the factors affect the production rate of oil (formational skin factor, partial penetration factor and completion skin factor) and how can we decrease their affected. 3- To understand drill stem testing (DST) that done in the oil well giving many information about reservoir characteristics that may be estimated from DST analysis include; average effective permeability, reservoir pressure, identify reservoir fluids, well-bore damage, barriers and fluid contacts, radius of investigation and depletion. Calculation equations of these reservoir characteristics well be given with examples. 4- To develop the knowledge about the local treatment of crude oil to separate the dissolve and / or associate gas and water in crude oil. 5- Explaining the classification and design of the gas and water separated instruments and advantage of each one. 6- Illustrated Calculation and equations of the capacity of each type of oil separation design .
Module Learning Outcomes	1- Water and gas coning is the mechanism undelaying the upward movement of water and / or the down movement of gas and try to inter the perforated zone of the production wells. This curse will explain how to reduce the effect of water and gas coning on the production rate and properties of production crude oil.

مخرجات التعلم للمادة الدراسية	2- Many factors affected the maximum production rate, these are skin zone (formational skin factor), partial penetration skin factor and completion skin factor, all these factors are discuss and explain their mathematic equations to reduce their effect on the maximum production rate of crude oil.
	3- One of important well test after completion is drill stem testing (DST), which determine the production characteristic of a specific zone. DST chart (pressure versus time) give us the reservoir characteristic that may be estimated from the test and illustrated how to deal with their effect on production rate and depletion.
	4- Oil and gas separation will discuss in this course, it include separation of water and gas dissolve and / or associate in production crude oil, all the local treatment instruments and the capacity calculation of each types will be explain.
Indicative Contents المحتويات الإرشادية	The curse 2 of Petroleum product engineering is part of petroleum engineer deal with maximum production rate of crude oil of reservoir. production rate effected by many skin factor(formational skin factor, partial penetration skin factor and completion skin factor), in addition to well test (drill stem testing DST) and water – gas separation , that should take in considerations of the petroleum engineer.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The strategy of the learning of this module title is to explain the important scientific activity of product engineer in the field and how to take his consideration to increase maximum production of pure crude oil, in addition to practical for 15 hour in North Oil Company.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Water and Gas Coning
Week 2	Meyer and Gardner and Pirson Methods (Gas coning)
Week 3	Water Coning
Week 4	Simultaneous Gas and Water coning
Week 5	Completion Efficiency
Week 6	Flow efficiency
Week 7	Drill Stem Testing, DST

Week 8	Basics of DST operations
Week 9	Theory of Pressure Build-up Analysis
Week 10	Steps of determining reservoir properties by using Horner plot to analysis pressure buildup test.
Week 11	Reservoir and fluid anomaly indications
Week 12	Oil and Gas Separation
Week 13	Separators types
Week 14	Separators Design
Week 15	Mathematic calculation capacity of separation types.
Week 16	Examination

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in lab.
Required Texts	Petroleum product engineering Herish N. Hamarash	Yes
Recommended Texts	Petroleum product engineering (in Arabic) Prepared by: Barzan Ibrahim Ahme/Senior Reservoir Engineer/North Oil Company Modified by: Faaiz Al-Zubaidi/Assistant Lecturer/Kirkuk University	yas
Websites	All the websites deal with petroleum engineer	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Petroleum Production Engineering I/PRE315**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	45
تاريخ إعداد هذا الوصف	2023

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

Module Objectives أهداف المادة الدراسية	7- This course deal with all activity of product engineering starting from finishing of drilling well to end of oil well completion. 8- To understand the basic of Crude oil drive mechanisms in the reservoir. 9- To understand the completion design consideration, in tis context that the operation for which the production technologist is responsible, are at sharp end of project economics.(cash flow and cost). 10- To illustrated well completion methods to increase the production rate of oil. 11- To develop the knowledge I of oil and gas well perforation method sand types of perforation solutions.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	5- Identify the production technology, which attempts to maximize production (or injection)in a cost manner. 6- Ideally the hydrocarbons are recorded from the reservoir porous media by the drive mechanism weather it was natural or artificial, we can recognize the derive mechanism classification and types. 7- Discussion of completion design consideration give an indication to the project economics cash flow and cost. 8- Summarizing the completion design strategy assistant the petroleum engineer to select the best completion method of oil well. 9- Conventional tubular configuration assistant to identify types of completion methods, that accommodate the physical properties of reservoir.

	10- Selecting of perforating interval which is isolated and perforating by numbers of production packer setting method and perforating methods that accommodated to the physical properties of reservoir.
Indicative Contents المحتويات الإرشادية	Petroleum product engineering is part of petroleum engineer deal with production rate (or injection of oil and gas from (or in) reservoir, production rate effected by many factors (type of completion, mechanical derive mechanism, perforating interval, reservoir rocks properties ….etc.), that should take in considerations of the petroleum engineer.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The strategy of the learning of this module title is to explain the important scientific activity of product engineer in the field and how to take his consideration in of the type of well completion to success the project economy of the oil reservoir. In addition to field tutorial for 15 hour in North Oil Company.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Production Technology
Week 2	Reservoir Drive Mechanisms
Week 3	Radial Flow in the Reservoir
Week 4	Fluid flow equations
Week 5	Linear Flow of Incompressible Fluids
Week 6	Radial Flow of Incompressible Fluids
Week 7	Completion Design Consideration / Project economy of completion
Week 8	Methods of completion: 1- single zone
Week 9	Methods of completion: 2- multiple zone
Week 10	Selection of the flow conduit between the reservoir and surface

Week 11	Completion Equipment
Week 12	Production packer setting methods
Week 13	Perforation
Week 14	Perforation Charge Arrangement
Week 15	Perforation solution
Week 16	Examination

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in lab.
Required Texts	Petroleum product engineering Herish N. Hamarash	Yes
Recommended Texts	Petroleum product engineering (in Arabic) Prepared by: Barzan Ibrahim Ahme/Senior Reservoir Engineer/North Oil Company Modified by: Faaiz Al-Zubaidi/Assistant Lecturer/Kirkuk University	yas
Websites	All the websites deal with petroleum engineer	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Applied Reservoir Engineering II/PRE318
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Identify drive mechanism and which are useful in reservoir engineering calculations. Furthermore, course deals with study of aquifer and reservoir calculations as water influx and volume , Models of flow state. Regime and Type of reservoir fluids. Calculation of flow rates for different type and regime fluids.
Module Learning Outcomes	1- Developing the student's ability to deal with technical means related to reservoir engineering. 2- Developing the student's ability to understand the behavior of reservoir fluids and state of flow. 3- Developing the student's ability to deal with the type of fluids and reservoir geometries alike. 4- Developing the student's ability to dialogue and discussion. 5- Developing the student's ability to understand and apply mathematical equations, graphs, tables and Software related to the oil industry. 6- Learn how to deal with volumes, behaviors of aquifer and reservoir. 7- Learn how to calculate of water influx by using multiple models for different states of flow. 8- Applications to calculate of flow rate for sever types of fluids and reservoir geometries.
Indicative Contents	**Part A – Theoretical lectures** Classification of reservoir driving mechanisms (water drive reservoirs).

The Steady-State Model in the MBE. The unsteady-state model in the MBE. Natural Water Influx. Classification of aquifers, degree of Pressure Maintenance, outer boundary conditions, flow regimes, flow geometries [**6 hrs**]. Recognition of natural water influx. Study of water influx models, pot aquifer model in the MBE, schilthuis' steady-state model, hurst's modified steady-state model [**6 hrs**], The van Everdingen-Hurst Unsteady-State Model, edge-water drive, principle of superposition, bottom-water drive [**6 hrs**]. Fetkovich's Method [**2 hrs**]. Fluid Flow in Petroleum Reservoir, introduction, fluid types. Definition of fluid flow regimes. Fluid flow equations. Steady-State Flow, linear flow of incompressible fluids, linear flow of slightly compressible fluids, linear flow of compressible fluids [**6 hrs**], radial flow of incompressible fluids, radial flow of slightly compressible fluids, radial flow of compressible fluids [**4 hrs**].

Part B – Tutorial

calculate the initial oil-in-place MBE, Calculate the cumulative water influx by pot aquifer model [**9 hrs**]. Calculate the water influx rate ew in a reservoir whose pressure is stabilized for Steady-State Model. Calculation of reservoir voidage and water influx rate in Active water-drive reservoirs [**6 hrs**]. Calculation of water influx rate in Schilthuis' Steady-State Model, calculation of the daily production rate in order to stabilize the pressure. Calculate cumulative water influx by Hurst's Modified Steady-State Model [**9 hrs**].

calculate cumulative water influx by Van Everdingen-Hurst Unsteady-State Model (Edge-Water Drive). Using principle of superposition to calculate the cumulative water influx. Calculate the cumulative water influx as a function of time by using the bottom-water-drive. Calculate the water influx by using Fetkovich's method [**9 hrs**]. Calculations of datum level pressures, pressure gradients, and reservoir flow from static pressure, flow rate for slightly compressible liquid, the gas flow rate, pressure profile (distribution) and Calculation of gas flow rate [**12 hrs**].

Learning and Teaching Strategies

Strategies	Expanding students' perceptions about this science and its contents it includes that help in reservoir engineering understanding , Calculation of the volume of hydrocarbon in the reservoir. Identify the state of flow in the reservoir. Calculation of the volume of aquifer. In addition to the use of different modules in calculation of water influx. The applications to calculating steady-state flow for several types of fluid with different reservoir geometries and interactive tutorials that are interesting to the students.

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction, Reservoir Primary Recovery Mechanisms and Water drive reservoirs.
Week 2	The Steady-State Model in the MBE and The unsteady-state model in the MBE. Natural Water Influx and Classification of aquifers.

Week 3	Classification of aquifers:
	1. Degree of Pressure Maintenance.
	2. Outer boundary conditions.
	3. Flow regimes.
	4. Flow geometries.
Week 4	Water influx models, pot aquifer model in the MBE.
Week 5	Schilthuis' steady-state model.
Week 6	Hurst's Modified Steady-State Model.
Week 7	The Van Everdingen-Hurst Unsteady-State Model.
Week 8	Edge-Water Drive and Havlena and Odeh methodology (Van Everdingen-Hurst Unsteady-State Model).
Week 9	Principle of Superposition.
Week 10	Bottom-Water Drive, (Van Everdingen-Hurst Unsteady-State Model).
Week 11	Fetkovich's Method.
Week 12	Fluid Flow in Petroleum Reservoir, types of fluids, flow regimes.
Week 13	Fluid Flow Equations.
Week 14	Steady-State Flow, linear flow.
Week 15	Steady-State Flow, radial flow.

Delivery Plan (Weekly Tut. Syllabus)

	Material Covered
Week 1	Tut 1: Calculate the initial oil-in-place MBE.
Week 2	Tut 2: Calculate initial oil in place and Fractional recovery, two cases under bubble point and above bubble point.
Week 3	Tut 3: Calculate the water influx rate ew and Calculate the cumulative water influx.
Week 4	Tut 4: Calculate the water influx rate ew with calculation of instantaneous GOR.
Week 5	Tut 5: Calculate the cumulative water influx using Schilthuis' steady-state model.
Week 6	Tut 6: Calculate cumulative water influx at that time using Hurst's modified steady-state model.
Week 7	Tut 7: Use the Excel program to calculate cumulative water influx in Hurst's modified model.
Week 8	Tut 8:. Calculate water influx by Van everdingen-hurst unsteady-state model.
Week 9	Tut 9: Calculate the cumulative water influx by Principle of superposition.

Week10	Tut 10: Calculate the cumulative water influx for an infinite-acting bottom-water aquifer.
Week 11	Tut 11 Using Fetkovich's method, calculate the water influx.
Week 12	Tut 12: Calculate Datum Level Pressures, Pressure Gradients, and Reservoir Flow from Static Pressure.
Week 13	Tut 13: Calculate the flow rate at both ends of the linear system for slightly compressible liquid.
Week 14	Tut 14: Calculate the pressure profile (distribution) and the pressure drop
Week 15	Tut 15: Calculate the gas flow rate.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Reservoir Engineering Handbook, Tarek Ahmed, 4th edition (2010). •Applied Petroleum Reservoir Engineering, Ronald E. Terry and J. Brandon Rogers,(Craft & Hawkins Revisioned Edition) 3rd edition (2014).	Yes No
Recommended Texts	fundamentals of reservoir engineering LP. DAKE Senior Lecturer in Reservoir Engineering, Shell Internationale Petroleum Maatschappij B. V., The Hague, The Netherlands.	Yes
Websites	https://link.springer.com/book/10.1007/978-3-030-28140-3	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Rock Mechanics/PRE314
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	1. Learning the basics of rock mechanics, including the physical and mechanical properties of rocks, classifying them. 2. Identifying the failure mechanisms that break the rocks due to ground stresses. 3. Employing such mechanisms to evaluate and treat problems that occur in hydrocarbon reservoirs rocks, in the walls of drilled wells, as well as in generating hydraulic fractures. 4. Description of stresses in the earth before and after drilling a borehole. 5. Describing how a rock fails when drilling it. 6. Understanding the features of an extended leak off test. 7. Explaining the geometry of borehole shear and tensile failures. 8. Understand the differences in borehole stability in deviated wells from vertical wells. 9. Clarify the conditions for compaction and subsidence of a reservoir. 10. Building a mechanical earth model (MEM) for the hydrocarbon field. 11. Compute the optimum drilling mud weight window. 12. And hence to prevent failures and collapses in the walls of boreholes.
Module Learning Outcomes	Upon completion of this training module students should be able to: 1. Identify the physical and mechanical properties of rocks. 2. Characterize compressive, tensile and shear strengths of intact rocks as well as their deformation types and parameters.

مخرجات التعلم للمادة الدراسية	3. Classify intact rocks according to various systems. 4. Describe the physical and mechanical properties of discontinuity surfaces and their classification based on various systems. 5. Elucidate types of stress, strain, their Mohr Circle plot and generalized stress-strain curve for rocks. 6. Explain Elasticity, Linear and nonlinear Elasticity, Hooke's law, Poroelasticity and Biot-Hooke's law. 7. Illustrate Failure mechanics, Shear failure, Tensile failure, Pore collapse, Tresca, Mohr–Coulomb, Griffith and Modified Griffith criteria. 8. Describe the basic components of the Mechanical Earth Model and how the input data is derived. 9. Understand the reservoir compaction and consequently field subsidence. 10. Identify problems associated with reservoir compaction and subsidence. 11. Know the concept of reservoir stress path. 12. Comprehension the concept of Compaction drive mechanism.
Indicative Contents المحتويات الإرشادية	**Elasticity Theory**: Linear Elasticity- Elastic Moduli, Hooke's law, Poisson's ratio, Bulk Modulus, compressibility. Non-Linear Elasticity - Perfectly Elastic, Elastic with Hysteresis, Permanent Deformation. **Poroelasticity:** Two material phases (solid & fluid), Two stresses involved: External stress and Internal stress (pore pressure), two strains involved: Bulk strain, Zeta (ζ) parameter, Biot-Hooke's law. Drained Loading (Jacketed Test), Drained Loading (Unjacketed Test): Biot-Gassmann equation, Undrained Test (Effective Stress Principle): Effective stress concept (Terzaghi, 1923). **Failure mechanics:** Tensile failure, Shear failure: failure envelope, Tresca criterion, Mohr–Coulomb criterion, Griffith criterion, Modified Griffith criterion, Compaction failure. Hydraulic Fracturing: Extended Leak off Test (Minifrac). **Earth Stresses:** Stress in the Earth before and after drilling a borehole: Wellbore Stresses. Geometry of Borehole Shear Failures - Geometry of Borehole Tensile Failures. **Reservoir Geomechanics**: Compaction and subsidence - Modelling of reservoir compaction. Geomechanical effects on reservoir performance – Compaction drive. Geomechanics in reservoir simulation. **Mechanical Earth Model (MEM)**

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 home works and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction- Rock Mechanics and Rock Engineering concepts- Rock types- Physical, Engineering &Mechanical Properties of Intact Rocks- Tensile, Compressive and Shear Strength of Intact Rocks.
Week 2	Shear Strength Parameters of Intact Rocks: Mohr Diagram- Deformation of Intact Rock- Deformation Parameters: Modulus of Elasticity; Poisson's Ratio -Types of deformation of some rocks.
Week 3	Intact Rock Classification System based on: Compressive Strength; UCS & E; UCS, E &υ. Three methods for intact rock classification: Strength System; Modulus Ratio System; Strength – Deformation System.
Week 4	Physical and Mechanical Properties of discontinuity surfaces: Joint Wall Hardness; Schmidt Hammer Test- Shear Strength of Discontinuity surfaces. Classification Systems of discontinuity Surfaces: Joint Spacing OR Fracture Intercept: RQD-System.
Week 5	Stress, Strain, Deformation Characteristics: Types of stresses: Mohr Circle representation of stresses. Deformation - Ideal Materials: Elastic, Viscous, Plastic. Unconfined compression test: Generalized stress-strain curve for rocks, Compressive Strength, shear strength. Direct shear test: Confining Pressure, Triaxial test, Failure envelope. Tensile Strength.
Week 6	Elasticity: Linear Elasticity- Stress Tensor. Mean normal stress, Principal Stresses, Mohr's Stress Circle. Strain: Normal strain - Shear Strain - Strain Tensor- Volumetric Strain- Principal Strains. Elastic Moduli, Hooke's law. General relations between stresses and strains for isotropic materials, Bulk Modulus, compressibility, Some relations between elastic moduli, Strain Energy. Non-Linear Elasticity.
Week 7	Midterm Exam
Week 8	Poroelasticity: Two material phases (solid & fluid), Two stresses involved: External stress and Internal stress (pore pressure), two strains involved: Bulk strain, Zeta (ζ) parameter, Biot-

	Hooke's law. Drained Loading (Jacketed Test), Drained Loading (Unjacketed Test): Biot-Gassmann equation, Undrained Test: Effective stress concept (Terzaghi, 1923).
Week 9	Failure mechanics: Strength and related concepts. Shear failure, Tensile failure, Pore collapse. Effective stresses. Failure envelope, Tresca criterion, Mohr–Coulomb criterion, Griffith criterion, Modified Griffith criterion, Compaction failure. Fracturing: Extended Leak off Test.
Week 10	Earth Stresses: Stress in the Earth before drilling a Borehole - Factors controlling Earth Stresses: Tectonic Setting, Depth, Pore pressure, Lithology, Temperature and Structure. Stress in the Earth after drilling a Borehole: Wellbore Stresses: Far Field Stresses - Wellbore Stresses: Radial Stress, Tangential Stress, Axial Stress. Deviated borehole in an anisotropic stress field.
Week 11	Geometry of Borehole Shear Failures a) Shear Failure Shallow Knockout. (b) Shear Failure Wide Breakout. c) Shear Failure High-Angle Echelon. (d) Shear Failure Narrow Breakout. e) Shear Failure Deep Knockout. (f) Shear Failure Low-Angle Echelon. Geometry of Borehole Tensile Failures: a) Tensile Failure Cylindrical. (b) Tensile Failure Horizontal. (c) Tensile Failure Vertical Identification of Rock Mechanics Features on Borehole Images
Week 12	Reservoir Geomechanics: Compaction and subsidence - Modelling of reservoir compaction - Uniaxial reservoir compaction - The depleting sphere - Reservoir stress path - Time delayed reservoir compaction. From compaction to subsidence - The size of the subsidence bowl - Subsidence above a disk shaped reservoir - Stress alteration in the overburden.
Week 13	Geomechanical effects on reservoir performance – Compaction drive - Stress effects on porosity. Porosity change during depletion - Overburden correction of laboratory measured porosity - Stress effects on permeability.
Week 14	Geomechanics in reservoir simulation - Seismic reservoir monitoring - Fluid substitution - Changes in temperature, in pore pressure and reservoir stresses. Well problems and reservoir geomechanics - Reservoir geomechanics as a tool to optimize drilling and production strategies.
Week 15	Mechanical Earth Model (MEM):1D Mechanical Stratigraphy, 3D Framework Model. Calculating conditions for Rock Failure: Estimating appropriate drilling mud weight window. Borehole Stability in Deviated Wellbores: 1) In relaxed basins ($\sigma_v > \sigma_H > \sigma_h$): Drilling parallel to σ_H, Drilling parallel to σ_h. 2) In tectonically stressed basins ($\sigma_H > \sigma_h > \sigma_v$): Drilling parallel to σ_H, Drilling parallel to σ_h.
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: The physical properties of rocks I

Week 2	Lab 2: The physical properties of rocks II
Week 3	Lab 3: permeability experiment
Week 4	Lab 4:Point load test
Week 5	Lab 5: Splitting Tensile Strength Test (Brazilian)
Week 6	Lab 6: Uniaxial compressive test (UCS)
Week 7	Mid Term practical Exam
Week 8	Lab 8: Triaxial Compression Test
Week 9	Lab 9: Direct tensile test
Week 10	Lab 10: Direct Shear test
Week 11	Lab 11: Bending test
Week 12	Lab 12: Slaking and Durability test
Week 13	Lab 13: Schmidt test hammer
Week 14	Lab 14: Review
Week 15	Final practical Exam.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fjær, E., Holt, R.M., Horsrud, P., Raaen, X. and Risnes, R. 2008.Petroleum-related rock mechanics 2nd ed.	Yes
Recommended Texts	Goodman, R. E. (1989) Introduction to Rock Mechanics, John Wiley & Sons, New York. Jaeger, J. G. and cook, N. G., (1979) Fundamental of rock mechanics, Chapman & hall London. Zoback, M.D. (2007). Reservoir Geomechanics. Cambridge University Press, Cambridge, ISBN-978-0-521-77069-9.	Yes
Websites	http://thepowerofbook12.blogspot.com/0521146194	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Seismic Exploration/PRE311
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	8. To develop problem solving skills and understanding of seismic refraction and reflection theories through the application of many techniques. 9. To understand who seismic exploration is an important technique used in the exploration and extraction of oil and gas resources. 10. To obtain that seismic exploration is used to create three-dimensional images of the earth's subsurface that allow geologists and engineers to identify the location and potential of oil and gas deposits. 11. To understand that seismic exploration is also used in the mining industry to locate mineral deposits. 12. To understand that seismic exploration is a valuable tool for a range of industries and plays a critical role in the exploration and extraction of natural resources, as well as in engineering and construction projects.
Module Learning Outcomes	**Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.** 12. By analyzing this data, interpreters can determine the composition and

مخرجات التعلم للمادة الدراسية	structure of the Earth's subsurface, including the location of oil and gas reserves, mineral deposits, and potential earthquake hazards. 13. Seismic reflection is particularly useful for the specializers to identifying geological features such as faults, folds, and sedimentary layers. 14. Seismic tomography is particularly useful for specializers to studying the Earth's mantle and core, which are too deep to be studied using seismic reflection. 15. AVO analysis is particularly useful for specializers to identifying oil and gas reserves, as hydrocarbon-bearing rocks have unique reflection characteristics. 16. Seismic data interpretation is a complex process that requires specialized software and expertise from the specializers. 17. One tool commonly used in seismic data interpretation from the specializers is the seismic workstation, which help the geoscientists can quickly analyze large amounts of data and make informed decisions about drilling locations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Basic Theories & Fundamentals: Videos about the basic theories & fundamentals in the seismic exploration, seismic refraction, seismic reflection. [5 hrs.] Part B – Practical parts: Videos about the practical parts in both seismic refraction, seismic reflection methods. [5 hrs.]

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 types of simple experiments involving some sampling activities that are interesting to the students.

| | Delivery Plan (Weekly Syllabus) |
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Introduction: Types of seismic waves, velocities of rocks & fluids. SEISMIC WAVES: attenuation, amplitudes, reflection, refraction and diffraction .Acoustic impedance.
Week 2	Seismic wave propagation - Introduction - Huygens's principles The law of reflection using Huygens's principles The law of refraction using Huygens's principles - Diffraction - Fermat's principles.
Week 3	The law of refraction using Fermat's principles, The law of reflection using Fermat's principles The main characteristic features of seismic prospecting methods, Wave Terminology.
Week 4	Velocity in rocks is affected by…. , Methods of computing seismic velocity Spread Configurations.
Week 5	Refraction Seismic: Principle of refraction seismic. Wave front processes, field procedure, source of waves, geophones recording instruments. Interpretation of data to obtain the velocities and thickness over simple layered structures.
Week 6	Interpretation of seismic refraction data obtained over a two layered and three layered horizontal. Interpretation of seismic refraction data over a two layered inclined earth -faulted interfaces, dipping & irregular layers. Earth-reduced travel time plots, hidden & blind layers. Amplitude modeling, lateral velocity gradients & worldwide results Geological interpretation of refraction data.
Week 7	Seismic reflection surveying, Reflection and transmission of normally incident seismic rays.
Week 8	Geometry of reflected wave path, Normal move out (NMO - ΔT).
Week 9	Effect of NMO, Dipping Reflector, How to find the dip angle of dipping reflector?
Week 10	Dipping reflectors and migration, Ray paths of multiple reflections.
Week 11	The shot gather, Common mid-point profiling, Corrections applied to the seismic data, Static Correction.
Week 12	Dynamic Correction (NMO Correction), Method of computing NMO Correction.
Week 13	Digital processing of seismic data, Data processing Sequence.

Week 14	Essential Processing, True Amplitude Recovery, Data Editing, Common depth point (CDP) or Common reflection point (CRP), The importance of CDP-Stack, CDP-Gather,2-Optional processing, De-convolution, Trace equalization, Migration, Coherency, Characteristic of seismic events
Week 15	Seismic interpretation, Base map, Seismic sections, Synthetic seismogram, When there is a well and the well has synthetic seismogram, When there is a well and the well has no synthetic seismogram or there is no well, Seismic maps
Week 16	Preparatory week before the final Exam

	Delivery Plan (Weekly Lab. Syllabus)
	المنهاج الاسبوعي للمختبر
	Material Covered
Week 1	Lab 1: Elasticity theory and Elastic Moduli
Week 2	Lab 2: A seismic velocity survey in shallow depths/Uphole velocity survey
Week 3	Lab 3: Horizontal two –layer case
Week 4	Lab 4: : Horizontal three –layer case
Week 5	Lab 5: : Fault case
Week 6	Lab 6: : Dipping - layer case
Week 7	Lab 7: Picking reflectors – seismic reflection method
Week 8	Lab 8: Horizontal & Dipping reflectors
Week 9	Lab 9: Dynamic (NMO) and Static corrections
Week 10	Lab 10: Dipping reflector
Week 11	Lab 11: Dipping reflector

	Learning and Teaching Resources	
	مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	An introduction to Geophysical Prospecting by Dobrin, MB., MCGraw Hill, New Delhi, 1984.	Yes

	Applied Geophysics by Telford W.M. Geldart L.P. Sheriff, R.E. and Keys D.A. Oxford and IBH Publishing Co. Pvt. New Delhi. 1976.	
Recommended Texts	Applied and environmental geophysics, Reynolds, 1997	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Seismic Interpretation/PRE321
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	13. To develop problem solving skills and understanding of seismic interpretation (fundamentals and processing) through the application of many techniques. 14. To understand who seismic interpretation is an important technique used in the exploration and extraction of oil and gas resources. 15. To get that seismic interpretation is used to create three-dimensional images of the earth's subsurface that allow geologists and engineers to identify the location and potential of oil and gas deposits. 16. To understand that seismic interpretation is also used in many applications like environmental and geo-engineering studies. 17. To understand that seismic interpretation is a valuable tool for a range of industries and plays a critical role in the exploration and extraction of natural resources, as well as in engineering and construction projects.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.

مخرجات التعلم للمادة الدراسية	18. By analyzing the seismic data, interpreters can determine the composition and structure of the Earth's subsurface, including the location of oil and gas reserves, mineral deposits, and potential earthquake hazards. 19. Seismic interpretation is particularly useful for the specializers to identifying geological features such as faults, folds, and sedimentary layers. 20. Seismic tomography is particularly useful for specializers to studying the Earth's mantle and core, which are too deep to be studied using seismic reflection. 21. AVO analysis in seismic interpretation is particularly useful for specializers to identifying oil and gas reserves, as hydrocarbon-bearing rocks have unique reflection characteristics. 22. Seismic data interpretation is a complex process that requires specialized software and expertise from the specializers. 23. One tool commonly used in seismic data interpretation from the specializers is the seismic workstation, which help the geoscientists can quickly analyze large amounts of data and make informed decisions about drilling locations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Basic Theories & Fundamentals: Videos about the basic theories & fundamentals in the seismic interpretation. [5 hrs.] Part B – Practical parts: Videos about the practical parts in seismic interpretation methods. [5 hrs.]

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 types of simple experiments involving some sampling activities that are interesting to the students.

<table>
<tr><td colspan="2" align="center">**Delivery Plan (Weekly Syllabus)**

المنهاج الاسبوعي النظري</td></tr>
<tr><td></td><td>**Material Covered**</td></tr>
<tr><td>**Week 1**</td><td>Quality control of survey and processing.</td></tr>
<tr><td>**Week 2**</td><td>Picking a survey: reflection identification from synthetic seismogram, well-seismic ties, and measurements in time and in depth.</td></tr>
<tr><td>**Week 3**</td><td>Comparison of seismic and well data, check shot data, the modeling process, tying synthetic to seismic data.</td></tr>
<tr><td>**Week 4**</td><td>Mis-ties and their causes.</td></tr>
<tr><td>**Week 5**</td><td>Digitization map construction (quality map, isochron map), vertical & horizontal resolutions, types of reflectors, attributes of reflection signals.</td></tr>
<tr><td>**Week 6**</td><td>Seismic velocities, acoustic impedance, velocity maps, depth conversion, isopachs

seismic properties, fluid properties, seismic rock physics.</td></tr>
<tr><td>**Week 7**</td><td>Reporting and management presentation, seismic interpretation exercise, description of the data, interpretation of seismic lines, features revealed by the seismic data.</td></tr>
<tr><td>**Week 8**</td><td>What is reflector? Time versus depth, well log versus seismic data, seismic interpretation and subsurface mapping.</td></tr>
<tr><td>**Week 9**</td><td>Mapping of hydrocarbon bearing &water bearing structures, gas hydrates, pattern recognition, thin bed modeling, seismic modeling.</td></tr>
<tr><td>**Week 10**</td><td>Geological interpretation , location of stratigraphic traps ,direct detection of hydrocarbons ,wave equation migration and its various forms , artificial intelligence ,artificial neural network (ANN) and gas detection using AVO analysis.</td></tr>
<tr><td>**Week 11**</td><td>History and basic ideas of 3d interpretation techniques + resolution + examples of 3d data improvement + sampling requirements + volume concept + slicing the data volume + manipulating the slices +dynamic range and data loading +synergism and pragmatism in interpretation.</td></tr>
<tr><td>**Week 12**</td><td>Color, character & zero – phase ness: color principles, interpretative value of color+ assessment of color + assessment of zero phase scenes + physiological impact of color. structural interpretation: direct contouring & the importance of the strike perspective + fault recognition & mapping + interpretation in the vicinity of salt + composite displays.</td></tr>
</table>

Week 13	interpretation of seismic reflection data, the seismic interpretation tools, the seismic structural interpretation, the seismic structural features, the seismic stratigraphic interpretation, basic stratigraphic concepts
Week 14	Time laps 4d seismic: understand the use of gasman's equation to assess variations in reservoir fill during production (fluid substitution) and the uses of seismic attributes (e.g. avo)in time lapse 4d seismic analysis of hydrocarbon reservoirs. borehole seismic techniques
Week 15	Case histories of 3D & 4D seismic surveys.
Week 16	**Preparatory week before the final Exam.**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Reflection identification from synthetic seismogram, well-seismic ties.
Week 2	Comparison of seismic and well data, check shot data, the modeling process, tying synthetic to seismic data.
Week 3	Digitization maps, construction maps (isochron map, isopach map, velocity map).
Week 4	Vertical & horizontal resolutions.
Week 5	What is reflector? Time versus depth, well log versus seismic data, seismic interpretation and subsurface mapping.
Week 6	Seismic properties, fluid properties, seismic rock physics.
Week 7	Seismic signal phases, power of resolution.
Week 8	The seismic structural interpretation, the seismic structural features.
Week 9	The seismic stratigraphic interpretation, the seismic stratigraphic features.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	1- An introduction to Seismic interpretation .By Mcqulli n, R.,Bacon,M .And Barclay ,W.1984	Yes

	2- Interpretation Of Three – Dimensional Seismic Data .4th Ed. By .Brown Alistairs,R. AAPG Memoir 42 , 1996 3- Practical Seismic Interpretation for Petroleum Exploration	
Recommended Texts	1- Seismic Data Interpretation and Evaluation for Hydrocarbon Exploration and Production. 2- First steps in seismic interpretation.	No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

جامعة الموصل	المؤسسة التعليمية
قسم هندسة المكامن النفطية	القسم العلمي / المركز
Well logging/312	اسم / رمز المقرر
حضوري	أشكال الحضور المتاحة
2023-2024	الفصل / السنة
75	عدد الساعات الدراسية (الكلي)
2023	تاريخ إعداد هذا الوصف

	Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية
Module Objectives أهداف المادة الدراسية	18. To develop problem solving skills and understanding the application of techniques. 19. To understand well environment, formation evaluation, and reservoirs locations. 20. This course deals with the basic concept of well log. 21. This is the basic subject for all required well logs and their requirements . 22. To perform all required analysis and interpretations. 23. To determine subsurface reservoirs and its importance in oil industry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 24. Delineate the general principles of geophysical well logs 25. Determine the best well log operations 26. Recognize the basis of well logging. 27. Study of well log types and their uses. 28. Identify the Principle of modern well logs 29. Describe the types of well log corrections, well environment, and volume of

	shale.
	30. Explain the importance of every type of well logs and its uses.
	31. Discuss the operations of well log analyses.
	32. Discuss the various well log techniques and their importance in oil industry.
	33. Interpret the produced curves, and cross plots according to the type of reservoir.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. The theoretical basis of well log - Basic rock properties, petrophysics ,dynamic properties of rocks. Saturation parameters , Darcy's law, Archie's parameters , Cementation factor, Formation factor , Formation temperature , Tortuosity exponenet, Introduction to well logging, conditions of measurements - bore hole diameter, filtrate invasion [15 hrs] Types of Porosity logs- Density log, Applications, Factors affecting density log, Sonic log, Applications, Sonic tools, Calibration, log presentation Neutron log, Theory, Hydrogen Index ,Hydrocarbon effect, Chlorine effect, Shale effect, Tool operation, Neutron log, Log presentation, Calibration, Depth of investigation, vertical resolution, Mud type, Uses of log [20 hrs] Principles and applications of natural gamma logging, gamma (density) logging, Shape of SP curves and determination of formation boundaries, [10 hrs] Resistivity logging - Conventional sondes, electrical resistance, potential and gradient sondes, direct and reverse sondes, response of potential and gradient sondes over thin and thick beds, application and limitations of Resistivity logging. [15 hrs] Application of logging techniques in solving exploration related problems, Integration of geophysical methods, need for integration process of integration, advantages of integration [15 hrs]

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 types of simple experiments involving some sampling activities that are interesting to the students.

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Basic rock properties
Week 2	Saturation parameters
Week 3	Introduction to well logging
Week 4	Types of Porosity logs
Week 5	Density log
Week 6	Neutron log
Week 7	Sonic log
Week 8	Gamma ray log
Week 9	SP log
Week 10	Resistivity logging
Week 11	Potential and gradient sondes
Week 12	Application and limitations of Resistivity logging
Week 13	Application of logging techniques in solving exploration related problems
Week 14	Integration of geophysical methods
Week 15	Advantages of integration
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 well log
Week 2	Lab 2: Corrections of well log data
Week 3	Lab 3: Uses of porosity logs
Week 4	Lab 4: Gamma ray and its effect on lithology and porosity
Week 5	Lab 5: Resistivity log analyses
Week 6	Lab 6: Combination, and inerpretation
Week 7	Lab 7: Delineate the pay net zones

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Well logging for earth science, by Darwin V. Ellis, and Julian M. Singer, Springer, 2007	Yes
Recommended Texts	Well logging and formation evaluation, by Toby Darling, Gulf Professional Publishing, 2005.	No
Websites	https://www.sciencedirect.com/topics/engineering/well-logging	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Enhance Oil Recovery I**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

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

Module Objectives أهداف المادة الدراسية	1. The primary objective of Secondary Oil Recovery is to increase the amount of oil that can be extracted from oil reservoirs. Secondary Oil Recovery techniques aim to recover additional oil that is trapped or difficult to extract using conventional means. 2. Secondary Oil Recovery techniques can help extend the productive life of oil fields. By extracting additional oil, Secondary Oil Recovery methods can offset production declines and maintain or even increase the production rates from aging reservoirs. 3. Secondary Oil Recovery methods often require additional energy inputs to enhance oil recovery. Studying Secondary Oil Recovery techniques helps optimize the energy balance by evaluating the energy requirements, costs, and benefits associated with different EOR methods.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	studying Secondary Oil Recovery techniques aims to: 1- maximize oil recovery. 2- extend field life. 3-improve energy efficiency. 4- increase economic viability, 5- reduce environmental impact.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Oil recovery processes : Primary oil recovery Principal influences on the efficiency of enhanced recovery (6 hrs.) Secondary oil recovery -Injection well location (4hrs.) Oil displacement efficiency- Water injection (4hrs.) Optimum time to water flood Practical considerations in water injection projects (4hrs.) Displacement mechanisms (4hrs.) Water injection in regularly developed homogeneous reservoirs (4hrs.) Water injection performance calculations(4hrs.)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Secondary Oil Recovery refers to the techniques and strategies used to extract more oil from reservoirs beyond what can be achieved through primary recovery methods. Here are some common strategies used in Secondary Oil Recovery: Water flooding: This method involves injecting water into the reservoir to displace the oil and push it towards production wells. Gas Injection: In this technique, various gases such as natural gas, carbon dioxide (CO_2), or nitrogen are injected into the reservoir to improve oil recovery.

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction - Oil recovery processes : Primary oil recovery
Week 2	Principal influences on the efficiency of enhanced recovery
Week 3	Principal influences on the efficiency of enhanced recovery
Week 4	Secondary oil recovery -Injection well location
Week 5	Secondary oil recovery- Injection well location
Week 6	Oil displacement efficiency- Water injection
Week 7	Mid-term Exam + Oil displacement efficiency- Water injection
Week 8	Optimum time to waterflood Practical considerations in water injection projects
Week 9	Optimum time to waterflood

	Practical considerations in water injection projects
Week 10	Displacement mechanisms
Week 11	Displacement mechanisms
Week 12	Water injection in regularly developed homogeneous reservoirs
Week 13	Water injection in regularly developed homogeneous reservoirs
Week 14	Water injection performance calculations
Week 15	Production well completions
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Enhanced Oil Recovery, 1980: Marcel Latil, Charles Bardon, Jacques Burge and Pierre Sourieau , Institut Francais Du Petrole , 233p.	Yes
Recommended Texts	Donaldson, E. C., Chilingarian, G. V., & Yen, T. F. (Eds.). (1989). Enhanced oil recovery, II: Processes and operations. Elsevier.	Yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Reservoir Characterization
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

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 reservoir characterization (fundamentals and processing) through the application of many techniques. 2. Reservoir characterization is an important process in the oil and gas industry that involves understanding the geological properties of a reservoir. 3. Reservoir characterization involve analyzing the subsurface geology using seismic data, well logs, and core samples. 4. Reservoir characterization is a complex process that involves the collection of data from various sources to determine the physical and chemical properties of subsurface reservoirs. 5. Reservoir characterization is a complex process that involves the integration of multiple disciplines and data sets. It is essential for the successful exploration and production of oil and gas fields.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. By analyzing the many types of data, interpreters can determine the composition and structure of the Earth's subsurface, including the location of oil and gas reserves, mineral deposits, and potential earthquake hazards.

	2. Reservoir characterization is particularly useful for the specializers to identifying geological features and sedimentary layers.
	3. Reservoir characterization included seismic tomography is particularly useful for specializers to buildup many subsurface models.
	4. Reservoir characterization is a complex process that requires specialized software and expertise from the specializers.
	5. Reservoir characterization help the specializers to identifying geometry of depositional systems, sea level curves, accommodation space and cycle orders.
	6. Reservoir Characterization included recognizing of the unconventional resources in the hydrocarbon industry.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Basic Theories & Fundamentals: Videos about the basic theories & fundamentals in the reservoir characterization. [5 hrs.] Part B – Practical parts: Videos about the practical parts in reservoir characterization methods. [5 hrs.]

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 types of simple experiments involving some sampling activities that are interesting to the students.

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Seismo-stratigraphic interpretation of depositional systems and its role in petroleum exploration, integrating expertise for reservoir characterization.
Week 2	Unconventional resources in the hydrocarbon industry, compartmentalization of oil and gas reservoirs, scales and styles of geologic reservoir heterogeneity, applying reservoir characterization.
Week 3	Geologic significance of seismic reflections , amplitude variation with offset(lithologies, fluids, gases, porosities, & pressures), an understanding of the effects of lithology and bed spacing on reflection parameters amplitude, frequency, continuity of reflections, parallelism of reflection cycles to gross bedding, and therefore, to physical surfaces that separate older from younger sediments, reflection configurations.
Week 4	Seismic reflections and time-stratigraphy.
Week 5	the seismic stratigraphy approaches, seismic stratigraphy is often divided into several sub-areas analysis of seismic sequence, analysis of seismic facies, analysis of reflection character
Week 6	Recognition and discrimination of depositional sequences, boundaries of depositional sequences.
Week 7	Definition of seismic facies, principal types of seismic facies, stratigraphic interpretation of seismic facies.
Week 8	Unconformities recognized by reflection terminations, factors controlling deposition of cyclic sequences.
Week 9	Chrono-stratigraphy construction & interpretation chronostratigraphic significance of seismic reflections.
Week 10	Geology and geometry of depositional systems, sea level curves, accommodation space, and cycle orders.
Week 11	Carbonate sequences and Siliciclastic sequences.
Week 12	Seismic facies & Paleo-environmental analysis.
Week 13	Optimizing exploration & development.
Week 14	Review of Seismic Stratigraphy.
Week 15	VSP: A measurement that transfer Geology to Geophysics.
Week 16	**Preparatory week before the final Exam**

	Delivery Plan (Weekly Lab. Syllabus)
	المنهاج الاسبوعي للمختبر
	Material Covered
Week 1	Lab 1: Seismo-stratigraphic interpretation of depositional systems
Week 2	Lab 2: compartmentalization of oil and gas reservoirs, scales and styles of geologic reservoir heterogeneity, applying reservoir characterization.

Week 3	Lab 3: Geologic significance of seismic reflections , amplitude variation with offset,
Week 4	Lab 4: An understanding of the effects of lithology and bed spacing on reflection parameters amplitude, frequency, continuity of reflections, parallelism
Week 5	Lab 5: Seismic reflections and time-stratigraphy.
Week 6	Lab 6: Recognition and discrimination of depositional sequences, boundaries of depositional sequences.
Week 7	Lab 7: Definition of seismic facies, principal types of seismic facies, stratigraphic interpretation of seismic facies.
Week 8	Lab 8: Unconformities recognized by reflection terminations
Week 9	Lab 9: Chrono-stratigraphy construction & interpretation chronostratigraphic significance of seismic reflections.
Week 10	Lab 10: Geology and geometry of depositional systems, sea level curves, accommodation space, and cycle orders.
Week 11	Lab 11: VSP: A measurement that transfer Geology to Geophysics.

<table>
<tr><th colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</th></tr>
<tr><th></th><th>Text</th><th>Available in the Library?</th></tr>
<tr>
<td>Required Texts</td>
<td>1- Seismic stratigraphy, An Integrated Approach . By: Berg,O.R.&Woolverton, D.G.,AAPG Memoir 39 (1985).
2- Seismic Stratigraphic Interpretation And Petroleum Exploration ,1984 By Brown ,L.F. And Fisher ,W.L., AAPG .
3- Seismic –Stratigraphic Interpretation Of Depositional Systems. Examples From Brazilian Rift And Pull-Apart Basins .By Brown &Fisher ,1977
4- Seismic Stratigraphy –Applications To Hydrocarbon Exploration By Payton,C.E.1977
5- Vertical Seismic Profiling Technique Applications &Case Histories By Balch,A.H. And Lee,M.W.(1984) Reidel Scheriff, Seismic Stratigraphy</td>
<td>Yes</td>
</tr>
<tr>
<td>Recommended Texts</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Websites</td>
<td></td>
<td></td>
</tr>
</table>

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Reservoir Modeling
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents		
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية		
Module Objectives أهداف المادة الدراسية	6. Acquisition and interpretation of several seismic and well data. 7. Teach the basic concepts and techniques for the construction of a computer model of a petroleum reservoir. 8. Build a 3D geological and petrophysical models using static and dynamic data. 9. Integrating geological, geophysical, and petrophysical data into a 3D description of a reservoir. 10. The above models will enable an integrated approach for history match and performance predictions through reservoir simulation.	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	7. Explain the introduction to reservoir modeling, including the aims, principles, and general workflows. 8. Describe the main terminology, concepts, tools, and techniques used for generating 3D static and dynamic reservoir models. 9. Recognize some of the main issues in reservoir characterization and modeling, particularly uncertainty and heterogeneity. 10. Ability to construct a structural and stratigraphic model and determine the spatial distributions of facies and various petrophysical properties in the model. 11. Ability to deal with a mix of geological and spatial properties and the complex fluids present in the reservoir.	

	12. Enables and promotes the joint teamwork of geoscientists and engineers. 13. Ability to use Didger and Petrel software
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Part A – Reservoir Modeling Introduction** Introduction of Reservoir modelling, The Uses of Reservoir Modelling, The Modelling Workflow and Key Elements of Reservoir Modelling, definition of Static and Dynamic Properties of Reservoirs. [15 hrs] The Resolution and Resources of Data, Seismic Data, Dynamic Data. [15 hrs] Introduction to Heterogeneities in Reservoir and in Petrophysical Properties, studying the impact of heterogeneities on fluid flow. [15 hrs] **Part B - Types of Reservoir Models** Structural Model and Seismic Interpretation, Explain Structural Modeling Types. [15 hrs] Building the Stratigraphic Model and Geocellular Model. [15 hrs] Building the Property Model and Facies Model. [15 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم
Strategies	Encourage students' participation in classroom assignment, class discussion, class exercise, homework exercises, and answer review questions, all designed to develop a working knowledge of reservoir modeling. In addition, encourage students to visit several websites that improve their skills to use some reservoir modeling software.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of Reservoir modelling
Week 2	The Uses of Reservoir Modelling
Week 3	The Modelling Workflow and Key Elements of Reservoir Modelling
Week 4	Static and Dynamic Properties of Reservoirs
Week 5	The Resolution and Resources of Data
Week 6	Seismic Data, Dynamic Data
Week 7	Exam
Week 8	Introduction to Heterogeneities in Reservoir and in Petrophysical Properties
Week 9	Types of Reservoir Models

Week 10	Structural Model and Seismic Interpretation
Week 11	Structural Modeling Types
Week 12	Stratigraphic Model
Week 13	Geocellular Model
Week 14	Property Model
Week 15	Facies Model
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Using Didger software to digitize contour map.
Week 2	Lab 2: Insert input data to Petrel software
Week 3	Lab 3: Build surfaces and grid
Week 4	Lab 4: Build layering
Week 5	Lab 5: Build structural Model
Week 6	Lab 6: Build Property Model
Week 7	Lab 7: Scaling up

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	1- **Reservoir Modelling: A Practical Guide** by Steve Cannon, 2018. 2- **Reservoir Model Design:** A Practitioner's Guide by Philip Ringrose and Mark Bentley, 2015.	No
Recommended Texts	**Geostatistical Reservoir Modeling** by Michael J. Pyrcz and Clayton V. Deutsch, 2014.	No
Websites	https://www.youtube.com/watch?v=bfkE2ozt64&list=PLiIO8Yqo6LD0t2RNDxSAtI0SkdU01-Kz9&index=3 https://www.youtube.com/@user-fj8yw3fk6e/playlists	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Core analysis
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

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

Module Objectives أهداف المادة الدراسية	11. This course deals with the basic concept of coring and core analysis. 12. To develop the skills of identifying the rock types that make up the oil formations. 13. Identify the basic and special properties of reservoir rocks. 14. Identify and understand the basic methods of taking rock core.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 14. Recognize the rock types of oil reservoirs 15. Determine the optimal method for extracting rock core. 16. Discuss field and laboratory conditions for extraction methods. 17. Listed the laboratory analyzes that can be conducted and which are suitable for the purpose of drilling. 18. Description the geological and engineering rock model. 19. Discuss the basic and special characteristics of the rock model. 20. Determine the mathematical values of the basic and special properties of the rock model (ex. porosity and permeability).

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - Coring and core analysis objectives ,Coring hardware and maximizing core recovery Core-handling, wellsite procedures, and preservation, methods,wellsite Activites and wellsite core testing(geological testing,composition analysis,sedimentology) (12hr) Sidewall coring and analysis ,Organizing effective laboratory programs Porosity, permeability and fluid saturation, Quality control in core analysis Petrography and mineralogy(15hr). Special core analysis sample selection and statistical data analysis Core-log correlation (includes nmr log calibration, acoustic, nuclear, and electrical properties) an introduction to rock mechanics Wettability, relative permeability, capillary pressure, and reservoir fluid distribution Coring CSI(9hr). Data integration in reservoir simulation ,Final problem: design of coring and core analysis program ,Preparatory week before the final Exam(9hr).

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 types of simple experiments involving some sampling activities that are interesting to the students.

	Delivery Plan (Weekly Syllabus)
	المنهاج الأسبوعي النظري
	Material Covered
Week 1	Coring and core analysis objectives
Week 2	Coring hardware and maximizing core recovery
Week 3	Core-handling, wellsite procedures, and preservation
Week 4	methods,wellsite Activites and wellsite core testing(geological testing,composition analysis,sedimentology)
Week 5	Sidewall coring and analysis
Week 6	Organizing effective laboratory programs
Week 7	Porosity, permeability and fluid saturation
Week 8	Quality control in core analysis
Week 9	Petrography and mineralogy
Week 10	Special core analysis sample selection and statistical data analysis
Week 11	Core-log correlation (includes nmr log calibration, acoustic, nuclear, and electrical properties) an introduction to rock mechanics Wettability, relative permeability, capillary pressure, and reservoir fluid distribution
Week 12	Coring CSI
Week 13	Data integration in reservoir simulation
Week 14	Final problem: design of coring and core analysis program
Week 15	**Preparatory week before the final Exam**

<table>
<tr><td colspan="2">**Delivery Plan (Weekly Lab. Syllabus)**
المنهاج الأسبوعي للمختبر</td></tr>
<tr><td></td><td>**Material Covered**</td></tr>
<tr><td>**Week 1**</td><td>Lab 1: static permeability</td></tr>
<tr><td>**Week 2**</td><td>Lab 2: fallen permeability</td></tr>
<tr><td>**Week 3**</td><td>Lab 3: saturation</td></tr>
<tr><td>**Week 4**</td><td>Lab 4: primary /secondary /total porosity</td></tr>
<tr><td>**Week 5**</td><td>Lab 5: capillary pressure</td></tr>
</table>

	Learning and Teaching Resources مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	Core Analysis: A Best Practice Guide, (John Cubitt & Holt, Wales), 2015.	No
Recommended Texts	Advincedin coring and core analysis for reservoir formationevaluationm(C.E.Ubani&Y.B.Adeboye) 2018.	No
Websites	https://www.osti.gov/biblio/4772428	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Petroleum Economic
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course is designed to provide students with necessary economic knowledge. 1. To perform general aspects the upstream and the downstream segments. 2. This course deals with the key topics including Pricing, Market. 3. To understand the International Oil Trading. 4. Cash Flow techniques. 5. To understand Time value of money and Risk and Uncertainty. 6. Economic Analysis and others will be considered. 7. To give broad understanding of petroleum economics and prepare students to make economic analysis and evaluations 8. To encourage students' participation and interaction and fostering atmosphere of tolerance and respect 9. To develop economic sensitivity of engineers. 10. Deal with the Production Sharing Agreements.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of course the students will: 1. Get an understanding of the petroleum economics in all its aspects: reserves, investments, players, costs, benchmarking etc. 2. be able make simplified forecast of oil production

	3. get an understanding of Oil and Gas Market as well as International Trading 4. using cash flow techniques in economic analysis and evaluations 5. be able to build a simplified economic model of upstream project 6. Get an understanding of different kind of international agreements and especially Production Sharing Agreements.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Introduction</u> Definition of Petroleum, Types of Petroleum and its density, Definition of oil economics, Characteristics of the oil industry [15 hrs] <u>Part B - Petroleum Industry</u> The main aspects. Midstream and Downstream segments. The modern tendencies and the current condition of the industry. [10 hrs] <u>Part C- Oil and Gas Market. Main Players</u> Crude oil supply and demand. Crude oil characteristics, pricing, benchmarks. Sale contracts. Gas sales.International oil trading. Platts quotations. Wet and paper barrel, hedging. [10 hrs] <u>Part D- Crude oil characteristics</u> Crude oil supply and demand. Crude oil characteristics, pricing, benchmarks. Sale contracts. Gas sales. [10 hrs] Part E- Economic Analysis Economic Analysis, Economic Analysis, Rate acceleration projects. Equipment replacement. Leasing. [15 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	
	The structure of this course makes your individual study and preparation outside the class extremely important. The lecture material will focus on the major points introduced in the text and, as rule, essential points of lecture will be distributed in advance. Reading the supplementary materials from internet sources and having some familiarity with them before class will greatly assist your understanding of the lecture. After the lecture, you should study your notes and lecture presentations to be ready for class discussions and review sessions.

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Petroleum Industry, the main aspects. Midstream and Downstream segments. The modern tendencies and the current condition of the industry
Week 2	Learn about the types of Petroleum.
Week 3	Deals with the importance of the Petroleum economy.
Week 4	The importance of the Petroleum economy
Week 5	Characteristics of the oil industry
Week 6	Knowledge of horizontal and vertical integration of the oil industry
Week 7	Manufacturing industry
Week 8	The importance of reserves and influencing factors
Week 9	Depleted resource cycle
Week 10	International Agreements Production Sharing Agreement
Week 11	Economic Analysis. Rate acceleration projects. Equipment replacement.
Week 12	Oil and Gas Market. Main Players
Week 13	Petroleum storage types and their impact on fluctuations in oil prices
Week 14	Financing and Ownerships Source of financing. Cost of capital
Week 15	OPEC and the production quota system
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 Market. Main Players	NO
Required Texts	International oil trading.	NO
Recommended Texts	دراسات في اقتصاديات النفط والسياسة النفطية	Yes
Websites	https://www.petroskills.com/en/training/courses/basic-petroleum-economics---bec---elearning-course~p13175	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Graduate Project I/PRE416**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

<table>
<tr><td colspan="2" align="center">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>Students should be able to:

Apply theoretical knowledge: Students will be able to apply the theoretical knowledge they have learned in their Petroleum engineering program to real-world engineering projects.
Develop design skills: Students will develop their design skills by going through the entire design process, from problem identification to prototyping.
Gain practical experience: Students will gain practical experience in applying Petroleum engineering principles and concepts to real-world design projects.
Enhance problem-solving skills: Students will enhance their problem-solving, critical thinking, and design skills.
Develop teamwork skills: Students will develop their ability to work collaboratively in teams and effectively communicate their design solutions.
Cultivate creativity: Students will cultivate their creativity, innovation, and project management skills

</td>
</tr>
<tr>
<td>Module Learning Outcomes
مخرجات التعلم للمادة الدراسية</td>
<td>By the end of this module, students should be able to:

Utilize petroleum engineering principles and concepts to identify, analyze, and solve practical design challenges.
Generate and assess design concepts employing appropriate methodologies, tools, and techniques.
Display proficiency in designing and conducting experiments, as well as analyzing and interpreting data.

</td>
</tr>
</table>

	4- Create and develop functional prototypes, taking into account factors like performance, reliability, and safety.
	5- Demonstrate proficiency in employing modern petroleum engineering tools, techniques, and skills required for engineering practice.
	6- Effectively communicate design solutions through technical reports, presentations, and documentation.
	7- Collaborate effectively in teams, showcasing strong teamwork, communication, and project management abilities.
	8- Reflect on the design process, identify areas for improvement, and adapt to evolving project requirements.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Design Project Introduction [10 hrs] • Provide an overview of the project module and its objectives. • Define the scope, objectives, and constraints of the project. • Identify and comprehend the problem statement. • Conduct thorough research and study relevant to the project idea. Concept Generation and Evaluation [10 hrs] • Generate diverse design concepts that address the problem statement. • Evaluate and select design concepts based on predefined criteria, considering factors such as feasibility, efficiency, and cost-effectiveness. • Create concept sketches, diagrams, and models to visualize and refine the chosen design concepts. • Gain understanding of existing solutions, technologies, and pertinent concepts that can guide the design and implementation process. Research and Background Study [10 hrs] • Develop a comprehensive plan and design for the project, encompassing system architecture, circuit diagrams, software flowcharts, and structural designs. • Break down the project into smaller tasks and establish deadlines for each task to ensure effective project management. • Conduct further research and background study to enhance the understanding of the project's technical requirements and potential challenges. • Apply petroleum engineering principles and relevant theories to inform the design decisions and optimize the project's performance. Presentation and Demonstration [20 hrs] • Prepare a compelling presentation to showcase the project to an audience. • Highlight the project introduction, literature review, problem statement, and the methodology employed to address the problem. • Present the final report, including the design details, testing results, and any recommendations or improvements. • Engage with faculty members, peers, and petroleum industry professionals to receive feedback and validate the project's effectiveness and relevance.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main approach for conducting this module will focus on promoting active student engagement in exercises aimed at improving their critical thinking abilities. This will be achieved through a combination of classroom sessions, interactive tutorials, and the exploration of sampling activities that capture the students' interest. The goal is to encourage students to refine and expand their critical thinking skills throughout the learning process.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Provide an overview of the module and clearly state its objectives.
Week 2	Define the project's scope, objectives, and any constraints that need to be considered.
Week 3	Identify and thoroughly understand the problem statement relevant to the project.
Week 4	Conduct comprehensive research and study related to the project idea.
Week 5	Generate multiple design concepts for the project.
Week 6	Evaluate and select design concepts based on predetermined criteria.
Week 7	Create concept sketches, diagrams, and models to visualize the selected design concepts.
Week 8	Participate in Seminar I to present and discuss the project progress.
Week 9	Gain a deep understanding of existing solutions, technologies, and relevant concepts that will guide the design and implementation of the project.
Week 10	Develop a detailed plan and design for the project, including system architecture.
Week 11	Break down the project into smaller tasks and establish deadlines for each task.
Week 12	Participate in Seminar II to present the progress and receive feedback.
Week 13	Prepare a presentation that showcases the project, highlighting the introduction, literature review, problem statement, and the methodology employed to solve it.
Week 14	Present the final report to faculty members, peers, and petroleum industry professionals.
Week 15	Provide an overview of the module and clearly state its objectives.
Week 16	**Preparatory week before the final Exam**

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Enhanced Oil Recovery II/PRER417**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	45
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	4. The primary objective of EOR is to increase the amount of oil that can be extracted from oil reservoirs. EOR techniques aim to recover additional oil that is trapped or difficult to extract using conventional means. 5. EOR techniques can help extend the productive life of oil fields. By extracting additional oil, EOR methods can offset production declines and maintain or even increase the production rates from aging reservoirs. 6. EOR methods often require additional energy inputs to enhance oil recovery. Studying EOR techniques helps optimize the energy balance by evaluating the energy requirements, costs, and benefits associated with different EOR methods.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	studying enhanced oil recovery techniques aims to : 1- maximize oil recovery 2- extend field life 3- improve energy efficiency 4- increase economic viability 5- reduce environmental impact

	6- drive technological advancements in the oil production sector.
Indicative Contents المحتويات الإرشادية	-Gas EOR methods, N2 flooding, CO2 Enhanced Oil Recovery , Mechanisms -Miscible And Immiscible CO2-EOR. -Gas recycling in gas-condensate reservoirs. -Types of Enhanced Oil Recovery (EOR); Gas Injection, chemical flooding,Thermal flooding - Chemical methods: ways , types, functions -Polymer flooding process, Properties of polymer solutions -Mobility control and profile control processes, Resistance factor, Injectivity behaviour, Wellbore profile control, Planning polymer flood projects. -Polymers for Enhanced Oil Recovery Technology, Principle and mechanism - Recently used polymer, Polyacrylamides, Xanthan Gum/Biopolymer - Superabsorbent polymer composite (SAPc) as polymer for EOR -Alkaline flooding process, Entrapment of residual oil, Displacement mechanisms in alkaline flooding, Reservoir selection, Oil properties, Reservoir characteristics. -Thermal recovery process, The effects of temperature on hydrodynamic fluid properties, Liquid viscosity, Relative permeability, Thermal recovery processes, Steam injection, In situ combustion ,Hot water injection.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Enhanced Oil Recovery (EOR) refers to the techniques and strategies used to extract more oil from reservoirs beyond what can be achieved through primary and secondary recovery methods. Here are some common strategies used in EOR: Chemical Injection: Chemicals such as surfactants, polymers, and alkalis are injected into the reservoir to alter the properties of oil and improve displacement. Thermal Methods: These techniques involve the application of heat to reduce oil viscosity, improve mobility, and enhance oil recovery. Common thermal methods include steam injection, cyclic steam stimulation (CSS), steam-assisted gravity drainage (SAGD), and in-situ combustion.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Gas EOR methods: CO2 Enhanced Oil Recovery, N2 flooding, Mechanisms
Week 2	Advantages and disadvantages, Miscible And Immiscible CO2-EOR
Week 3	Gas recycling in gas-condensate reservoirs
Week 4	Chemical methods: types; Polymer flooding , Surfactant flooding ,Alkaline (caustic) flooding
Week 5	Polymer flooding process ; Properties of polymer solutions: Planning polymer flood projects:

Week 6	Polymers for Enhanced Oil Recovery Technology
Week 7	Mid-term Exam + Recently used polymer
Week 8	Surfactant flooding
Week 9	Surfactant flooding
Week 10	Alkaline (caustic) flooding
Week 11	Alkaline (caustic) flooding
Week 12	Alkaline flooding process
Week 13	Displacement mechanisms in alkaline flooding:
Week 14	Thermal recovery process
Week 15	Steam injection, In situ combustion ,Hot water injection
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	-Enhanced Oil Recovery, 1980: Marcel Latil, Charles Bardon, Jacques Burge and Pierre Sourieau , Institut Francais Du Petroleum , 233p.	Yes
Recommended Texts	-Lake, L. W. (1989) Enhanced Oil Recovery, Prentice Hall -Donaldson, E. C.; Chilingarian,G. V. and Yen, T. F. (1985) Enhanced Oil Recovery –I Fundamentals and Analysis, Elsevier. -KUNIEDA, H., MAEKAWA, M., & SHINODA, K. (1983). Basic Study on Tertiary Oil Recovery Factors to Attain Ultralow Interfacial Tensions. Journal of Japan Oil Chemists' Society, 32(12), 740-743.	yes
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Reservoir Simulation/PRE 418**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

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

| **Module Objectives**
أهداف المادة الدراسية | <ol start="15"> To understand the basic concepts of reservoir simulation. To understand the mathematical and engineering approaches of reservoir simulation. To comprehend partial differential equations (PDEs) in simulation. To be able to simulate single-phase and multi-phase fluid flows in petroleum reservoirs. To test hypotheses into practical oil field simulation. To deal with wells completed in a single layer and in multilayers and presents fluid flow rate equations for different well operating conditions. To understand the initial and boundary conditions. To get knowledge on the different coordinate systems used in reservoir simulations. |

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of reservoir simulation course, students will be able to: 1. Explain the concept of petroleum reservoir simulation. 2. Explain the objectives, methodologies and applications of reservoir simulation. 3. Demonstrate the major steps and procedures to generate a reservoir simulator. 4. Describe the physical laws governing fluid flow in porous media. 5. Develop single-phase and multi-phase petroleum reservoir flow. 6. Solve the governing partial differential equations utilizing finite difference techniques and interpret the potential numerical errors. 7. Utilize a commercial reservoir simulator to analyze reservoir performance in response to various development strategies. 8. Acquire some expertise in history matching a reservoir simulation model. 9. Demonstrate the ability to work cooperatively in groups to complete the required assignments. 10. Write a program for basic problems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **<u>Part A – Reservoir Simulation Theory</u>** • Introduction, overview and deep dive into the development of a reservoir simulator including methodologies, steps and procedures and its connection with other oil exploration and production activities in the field **[8 hours]** • Theoretical background on the aspect of fluid flow in porous media and derivation of fluid flow equations including conversation of mass, conversation of momentum and constitutive equation for porous materials **[6 hours]** • Darcy's law and its applications in reservoir simulation, standard and compositional black oil model and equations **[6 hours]** • An overview about the simulation discretization of the fluid flow equations and introduction of finite difference and finite elements approaches used to generate a complete reservoir simulator **[4 hours]** • General form of the one-phase, one-dimensional, horizontal partial differential equations (PDEs), reservoir simulation coordinate system, and simulation model testing and validation **[6 hours]** **<u>Part B – Application of Reservoir Simulation</u>** • An overview on the reservoir simulation software (ECLIPS or CMG) including software background, installation, windows/tabs and preparation of the simulation platform **[3 hours]** • Tutorial on the practical usages of the reservoir simulation and consideration of real-world case study (preferably Iraq) **[3 hours]** • Familiarization with the required data to build a reservoir model including data gathering and data input **[3 hours]** • Construction of a simulation grid and geological model **[6 hours]** • Fluid and rock-fluid properties, model initialization and characteristics **[6 hours]** • Well description, history matching and forecast simulation **[9 hours]** • Model run, testing and validation **[5 hours]**

	• Analyze input data and results of a 3D full field simulation model with different scenarios **[5 hours]** • Applications of the reservoir simulation models in the commercial component of the oilfield production **[2 hours]** • Introduction to program writing related to reservoir simulation **[3 hours]**

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The primary strategy for delivering the reservoir simulation module will be to promote student participation in the exercises while simultaneously refining and expanding their critical thinking abilities. This will be accomplished through lectures, consideration of real-world data, engagement with real case studies, interactive seminars, and the consideration of simple experiments involving some engaging sampling activities.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction – Principles of simulation and modelling, simulation objectives, methodology and steps
Week 2	Modelling concepts and system simulation
Week 3	Purpose and benefits of numerical reservoir simulation
Week 4	Reservoir simulation relationships with other exploration and production matters
Week 5	Types of reservoir simulation models
Week 6	The fluid flow equations in a porous media
Week 7	Conversation of mass and conversation of momentum equations
Week 8	Darcy's law and its applications
Week 9	Compositional and black oil model equations
Week 10	Numerical Discretization of the Fluid Flow Equations
Week 11	Notions about Finite Differences and Finite elements
Week 12	Types of Numerical Schemes: a) IMPES. b) Fully Implicit. c) Streamlines.
Week 13	General form of the one-phase, one-dimensional, horizontal PDE
Week 14	Coordinate systems in reservoir simulation
Week 15	Reservoir simulation stability, accuracy and validation
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Lab 1:** Tutorial on Practical Use of Reservoir Simulation
Week 2	**Lab 2:** Data gathering, geological model and grid construction
Week 3	**Lab 3:** Fluid and rock-fluid properties, aquifer modelling and initialization
Week 4	**Lab 4:** Well description, history matching and forecast simulation
Week 5	**Lab 5:** Basic exercises about finite difference discretization.
Week 6	**Lab 6:** Modify and run with Eclipse/CMG software a vertical cross-section model to mimic reservoir
Week 7	**Lab 7:** Analyze input data and results of a 3D full field simulation model with different scenarios

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1- Reservoir Simulation: Mathematical Techniques in Oil Recovery, Z.Chen,2007 2- Practical Enhanced Reservoir Engineering: Assisted with Simulation Software, Abdus Sattar, 3- Petroleum Reservoir Simulation: The Engineering Approach, Second edition, Jamal H. Abou-Kassem M. Rafiqul Islam S.M. Farouq Ali	Yes
Recommended Texts	Advanced Petroleum Reservoir Simulation,2010, M.R.Islam	No
Websites	All trusted academic and industrial companies' websites that offer reservoir simulation topics. Subject to be discussed with module leader	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	**جامعة الموصل**
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Advanced petroleum reservoir engineering/PRE415**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2024-2023
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

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

Module Objectives أهداف المادة الدراسية	23. This course deals with the basic concept of fractured reservoir . 24. To develop the skills of identifying the fractures types that make up in oil formations. 25. Understand and analyzing cracked oil reservoir . 26. Identify of the geological condition . 27. Understand and identify natural and hydraulic fracture of hydrocarbon reservoir . 28. Understand the Fluid Flow in Fractures Rock.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 21. Recognize the fracture types of hydrocarbon reservoirs. 22. Determine the type of fracture (joint and fault) . 23. Description the natural fracture in different type rock of hydrocarbon reservoir with global and local example . 24. Listed the parts of fault . 25. Listed classification of joint and fault 26. Description The importance of the fault to the geologist and petroleum

	engineer
	27. Discuss the hydraulic fractures .
	28. Description Fluid Flow in Non-Porous Fractured Rock, Fluid Flow in Fractures Rock of Double Porosity and Fluid Displacement in single Matrix Block.

| **Indicative Contents**
المحتويات الإرشادية | Indicative content includes the following.

- Introduction, What is a fracture?,Origin of fracture ,Types of fracture (joint and fault)(12hr).

Classification of fracture (joint and fault) ,Geological condition of fracturing
And Fracture detection and evaluation (12hr).
Naturally fractured reservoir (carbonate ,shale and sand reservoir)
,Hydraulic fractured reservoir(6hr) .
Fluid Flow in Non-Porous Fractured Rock, Fluid Flow in Fractures Rock of Double Porosity and Fluid Displacement in single Matrix Block.(9hr).
Production mechanism of Fractured Reservoirs,Numerical Simulation of Fractured Reservoirs and Iraqi Fractured Reservoirs(9hr). |

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 types of simple experiments involving some sampling activities that are interesting to the students.

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
Week 1	Introduction.
Week 2	What is a fracture?
Week 3	Origin of fracture
Week 4	Types of fracture (joint and fault)
Week 5	Classification of fracture (joint and fault)
Week 6	Geological condition of fracturing
Week 7	Fracture detection and evaluation
Week 8	Naturally fractured reservoir (carbonate ,shale and sand reservoir)
Week 9	Hydraulic fractured reservoir
Week 10	Fluid Flow in Non-Porous Fractured Rock.
Week 11	Fluid Flow in Fractures Rock of Double Porosity
Week 12	Fluid Displacement in single Matrix Block.
Week 13	Production mechanism of Fractured Reservoirs.
Week 14	Numerical Simulation of Fractured Reservoirs
Week 15	**Iraqi Fractured Reservoirs**

	Delivery Plan (Weekly Lab. Syllabus)
	المنهاج الاسبوعي للمختبر
	Material Covered
Week 1	pro 1: naturally fracture
Week 2	Discussion naturally fracture
Week 3	Discussion naturally fracture
Week 4	Discussion naturally fracture
Week 5	Pro2: hydraulic fracture
Week6	Discussion hydraulic fracture
Week7	Discussion hydraulic fracture

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Fractured Reservoir Engineering, by T.D. VAN GOLF-RACHT, 1982.	No
Recommended Texts	Tarek Ahmed - Reservoir Engineering Handbook 3Ed (2006)	yes
Websites	https://www.mdpi.com/1996-1073/12/15/2897	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	Well testing/PRE420
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	75
تاريخ إعداد هذا الوصف	2023

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

Module Objectives أهداف المادة الدراسية	29. To understand principles of well testing. 30. Deals with the Reservoir Evaluation. 31. To understand Types of Tests. 32. To determine the Initial reservoir pressure parameters measure. 33. To determine the Average reservoir pressure parameters measure. 34. The course deals with Formation damage due to drilling and completion (skin effect) 35. This course deals with Fluid flow equations. 36. To develop problem solving Darcy's Law. 37. To solving the Diffusivity Equation. 38. The course deals with the Generalization of the Skin Concept 39. This course deals with the basic concept of electrical circuits. 40. This is the basic subject for all electrical and electronic circuits. 41. To understand Kirchhoff's current and voltage Laws problems. 42. To perform mesh and Nodal analysis.
Module Learning Outcomes	On successful completion of this course students will be able to:

مخرجات التعلم للمادة الدراسية	1. Select appropriate well testing methods and interpret tests' data. 2. Describe the fundamentals behind all types of well test (DST, Formation Testing, Buildup, Interference and Pulse Tests, etc.) 3. Calculate the reservoir and well properties that can be obtained from various types of tests 4. Analyze data and assess strengths and limitations of well test interpretation 5. Derive long term production forecast from a short test
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Introduction Overview and introduction: Types of reservoir and well situations,Types of Tests ,Fundamental concepts. [10 hrs] Part B - Fluid Flow in Porous Media Derivation of diffusivity equations, Solutions to the diffusivity equations, Radius of investigation, Wellbore storage and skin, Principle of superposition. [10 hrs]. Part C - Pressure Build-up Tests Ideal and actual build-up tests for oil well (Horner method), Qualitative behaviour of field tests, Effects and duration of after-flow, Reservoir limit tests, Analysis for gas well build-up tests, Modification for multiphase flow. [15 hrs]. Part D- Well Flow Tests Pressure drawdown tests for oil well, Multi-rate tests, Well Tests Using Type Curves· Fundamental of type curves, Ramey's type curves. [10 hrs]. Part E- Gas Well Test Analysis Flow-after-flow tests, Isochronal tests, Modified isochronal tests, Unusual Well Situations, Stimulated wells, Horizontal wells. [15 hrs]. Part F- Advanced Well Testing Methods Interference testing, Pulse testing, Well tests in Naturally Fractured Reservoirs, Naturally fractured reservoir models, Pseudo-steady-state matrix flow model, Transient matrix flow model, Well Test Design,Time-rate schedule. [15 hrs].

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, principles of well testing.
Week 2	Well Test Objectives, Reservoir Evaluation.
Week 3	Types of Tests
Week 4	To determine the Initial reservoir pressure parameters measure.
Week 5	To determine the Average reservoir pressure parameters measure.
	To determine the following parameters measure: ✓ Permeability (K). ✓ Formation flow capacity, kh. ✓ Formation damage due to drilling and completion (skin effect). ✓ Drainage area.
Week 6	How Do We Test Wells
Week 7	Key Points of Well-Test Interpretation
Week 8	Pressure Transient Analysis
Week 9	Wellbore Storage
Week 10	Pressure Buildup Test
Week 11	Drawdown Test
Week 12	Infectivity Test
Week 13	Principle of Superposition
Week 14	Reservoir aspects - Well aspects
Week 15	Fluid aspects (Gas wells, Multiphase flows)
Week 16	Preparatory week before the final Exam

	Delivery Plan (Weekly Lab. Syllabus)
	المنهاج الاسبوعي للمختبر
	Material Covered
Week 1	Lab 1: Reservoir Evaluation.
Week 2	Lab 2: Initial reservoir pressure parameters measure
Week 3	Lab 3:
Week 4	Lab 4
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Petroleum Reservoir Management/PRE421**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

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 reservoir management (fundamentals and processing) through the application of many techniques. 2. Petroleum reservoir management is a subtopic of reservoir engineering that is concerned with the optimization of oil and gas production from underground reservoirs. 3. Involves the integration of geological, geophysical, and engineering data to develop a comprehensive understanding of the reservoir's characteristics. 4. Effective petroleum reservoir management is critical for maximizing oil and gas production and ensuring the long-term viability of a field. 5. Requires a deep understanding of geological and engineering principles, as well as the ability to apply this knowledge in a practical and innovative way.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 2. The reservoir management consists on the application, within a given fiscal and contractual frame, of well-established industrial technologies and field best practices to a hydrocarbon reservoir, in order to efficiently perform the field operations and maximize the economic return of the investments. 3. Reservoir Management relies on the use of human, technological and financial

	resources to capitalize on profits from a reservoir by optimizing the hydrocarbon recovery while minimizing both the capital investments and the operating costs.
	4. Reservoir management has advanced through various stages due to better quality techniques, improved knowledge of reservoir behavior.
	5. Decreasing of the risk, increasing of the oil and gas production, increasing of the oil and gas reserves.
	6. Minimization of the capital expenditures, minimization of the operating costs.
	7. Maximizing of the final hydrocarbon recovery.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Basic Theories & Fundamentals: Videos about the basic theories & fundamentals in the reservoir management. [5 hrs.] Part B – Practical parts: Videos about the practical parts in reservoir management methods. [5 hrs.]

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 types of simple experiments involving some sampling activities that are interesting to the students.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	What is reservoir management & Integration? Reservoir Management / Fundamentals.
Week 2	The base map, isopach map & net pay thickness. Cross sections & well correlation using logs. Iso-porosity map, bubble map & routine map analysis. Special core analysis, screening of core data, using correlations to estimate missing data. Reservoir Management / Data Acquisition and Characterization.
Week 3	Porosity, Water saturation, permeability & net/gross, Structural model, Stratigraphic model & Lithological model, Reservoir Management / Data Acquisition and Characterization
Week 4	Volumetric OOIP, Determination of reservoir type. Reservoir Management / Data Acquisition and Characterization
Week 5	Pressure analysis Reservoir Management / Data Acquisition and Characterization, Integrated Reservoir Modeling
Week 6	Building reservoir model. Integrated Reservoir Modeling.
Week 7	Material balance, History matching. Integrated Reservoir Modeling.
Week 8	Production forecasting. Integrated Reservoir Modeling.
Week 9	Optimization of surface facilities. Integrated Reservoir Modeling.
Week 10	Development strategies. Integrated Reservoir Modeling.
Week 11	Water flooding & EOR techniques. Integrated Reservoir Modeling.
Week 12	Drilling new wells. Integrated Reservoir Modeling.
Week 13	Suggesting additional necessary surface equipment. Integrated Reservoir Modeling.
Week 14	Uncertainty Management. Integrated Reservoir Modeling.
Week 15	Economic evaluation of the proposed strategy. Reservoir Management / Economics
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Reports in the base map, isopach map & net pay thickness. Cross sections & well correlation using logs. Iso-porosity map, bubble map & routine map analysis. Special core analysis, screening of core data, using correlations to estimate missing data.
Week 2	Lab 2: Reports in the Porosity, Water saturation, permeability & net/gross, Structural model, Stratigraphic model & Lithological model
Week 3	Lab 3: Reports in the Volumetric OOIP, Determination of reservoir type.
Week 4	Lab 4: Reports in the Pressure analysis, Building reservoir model, Material balance.
Week 5	Lab 5: Reports in the History matching, Optimization of surface facilities, Development strategies

Week 6	Lab 6: Reports in the Water flooding & EOR techniques, Suggesting additional necessary surface equipment
Week 7	Lab 7: Reports in the Economic evaluation of the proposed strategy.

	Learning and Teaching Resources مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	1- Integrated Reservoir Study, (Luca Cosentino), 2001 2- Computer-Assisted Reservoir Management, (Abdus Satter, Jim Baldwin & Rich Jespersen), 2000 3- Integrated Petroleum Reservoir Management, (Abdus Satter & Ganesh C. Thakur), 1994	Yes
Recommended Texts		No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

المؤسسة التعليمية	جامعة الموصل
القسم العلمي / المركز	قسم هندسة المكامن النفطية
اسم / رمز المقرر	**Graduate Project II/PRE422**
أشكال الحضور المتاحة	حضوري
الفصل / السنة	2023-2024
عدد الساعات الدراسية (الكلي)	60
تاريخ إعداد هذا الوصف	2023

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	Students will be able to: 1- Gain knowledge and assess the design, operation, and environmental factors associated with petroleum equipment and processes. 2- Acquire an understanding of different technology options, including Best Available Technologies by conducting literature reviews and referencing reliable sources and choose an appropriate equipment or process with optimal capacity. 3- Perform basic process design using steady-state simulation techniques. 4- Create equipment layout and plot plan drawings. 5- Conduct preliminary cost estimation for the designed process. 6- Develop effective presentation and project management skills.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of this module, students should be able to: 1- Prepare project feasibility reports for petroleum processes or plants. 2- Gather and utilize diverse sources such as market data, literature, and customer feedback to evaluate the available technologies in the market. Select a suitable process that aligns with site conditions, environmental regulations, and product quality requirements. 3- Conduct overall plant simulation, including estimation of utility consumption. 4- Generate equipment diagrams and Material Selection Diagrams (MSD). 5- Sizing all plant equipment and perform preliminary cost estimation using cost indexes, charts, and literature. 6- Estimate the preliminary cost of piping, instrumentation, equipment and construction. This helps determine the installation cost of the equipment or plant..

	7- Estimate preliminary utility and chemical consumption, and use this data to estimate the operating cost.
	8- Effectively manage a comprehensive project within a defined timeframe, presenting the key findings confidently and clearly to the audience
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **Information Gathering and Collaboration** [10 hrs] - Utilizing various resources for information gathering (e.g., citation tools, databases, research journals) and collaborating with team members for project completion. - Demonstrating teamwork and collaboration with others towards the successful completion of the project **Reservoir Modeling and Field Development Strategies** [10 hrs] - Understanding reservoir modeling and its advantages/limitations. - Exploring strategies for developing hydrocarbon fields using advanced tools . **Uncertainty Analysis and Economic Evaluation** [10 hrs] - Investigating uncertainties in reservoir parameters and verifying models. - Conducting economic evaluations for field development projects. **Reporting and Presentation** [20 hrs] - Writing a final report summarizing field development plan findings. - Delivering a presentation to communicate key project findings and recommendations

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary strategy for delivering this module will be to encourage students to participate in the exercises while refining and expanding their critical thinking skills. This will be accomplished through classes, interactive tutorials, and the consideration of simple experiments involving sampling activities that students find interesting.

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to design project**
Week 2	Formulating detailed design specifications and requirements.
Week 3	Utilizing engineering software and tools to analyze and simulate the design.
Week 4	Generating engineering drawings and models.
Week 5	Constructing operational prototypes of the design.
Week 6	**Seminar I**
Week 7	Performing tests to assess performance, reliability, and safety.
Week 8	Making iterative design enhancements based on test results.
Week 9	Creating technical reports and design documentation.
Week 10	Developing professional presentations to convey design solutions.
Week 11	Documenting the design process, encountered challenges, and lessons learned.
Week 12	**Seminar II**
Week 13	Presenting the final design solution to faculty, peers, and industry professionals.
Week 14	Demonstrating the functionality and effectiveness of the design prototype.
Week 15	Printing the final project and submitting it to the review committee.
Week 16	**Preparatory week before the final Exam**