

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Petroleum Geology		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	PEGE221		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	UGII	Semester of Delivery	
Administering Department	PE	College	OGE
Module Leader	Dr. Ahmd A. Ramdhan	e-mail	150073@uotechnology.edu.iq
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	PhD
Module Tutor	NA	e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	STGE215	Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Understanding the nature of the organic-rich source rock, the paleoquifers in which the petroleum flowed, and the trapping mechanism are important parts of Petroleum Geology. A petroleum engineers needs to have a broad knowledge of sedimentary geology (sedimentology and petrography), stratigraphy, structural geology, and hydrogeology.
Module Learning	* An ability to identify, formulate, and solve engineering problems by applying

Outcomes مخرجات التعلم للمادة الدراسية	principles of engineering, science, and mathematics. * An ability to develop the confidence necessary to successfully solve Mathematical problems with a computer. * An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
Indicative Contents المحتويات الإرشادية	The outcomes of this course are used to construct the evolutionary histories of sedimentary basins. Thus, a successful petroleum engineers needs a broad background, and a willingness to learn and apply a wide range of information and techniques to the problems of finding, developing, and exploiting a petroleum reservoir.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	<ol style="list-style-type: none"> 1. Have a basic understanding of the petroleum system, petroleum as a resource, and the value chain. 2. Have a basic understanding of petroleum formation and origin. 3. Understand how geologists conduct the search for petroleum resources through the value chain or the life cycle of a petroleum resource. This will include the processes involved and actual examples. 4. Learn details on how to begin evaluating a hydrocarbon play and developing a prospect. 5. Learn the concepts of migration and accumulation of hydrocarbon 6. Learn the principles of mapping a subsurface reservoir.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	INTRODUCTION What is petroleum geology?, Principal of petroleum geology, Why is Carbon so Important in the Life Cycle, Oil and Gas.
Week 2	ORIGIN OF PETROLEUM FORMS Characteristics of petroleum reservoirs, Exploration activities in a sedimentary basin.
Week 3	PETROLEUM TRAP 1 General Considerations, Structural Traps, Types of Structural traps, Stratigraphic Traps,
Week 4	PETROLEUM TRAP 2 Types of stratigraphic traps, Combination Traps, Hydrodynamic Traps
Week 5	ORIGIN, MIGRATION, AND ACCUMULATION 1 Origin of petroleum, Total Organic Carbon (TOC), Source Rocks, TOC Types,
Week 6	ORIGIN, MIGRATION, AND ACCUMULATION 2 Conversion of OM to HC, Dehydrogenization and Carbonization, Deoxygenization and Carbonization.
Week 7	SOURCE ROCK QUALITY Maturation, Purposes of maturation indicators, Lopatin's TTI Index, Other Maturation Indicators, Oil Source Rock Criteria.
Week 8	MIGRATION OF HYDROCARBON 1 General considerations, Formation water, Formation water composition, Pressure and temperature during burial,
Week 9	MIGRATION OF HYDROCARBON 2 Evidence for Migration, Primary Migration, Primary Migration Controversy, Primary Migration Mechanisms ,Secondary Migration, Migration Pathways
Week 10	PETROLEUM RESERVOIR CHARACTERISTIC
Week 11	EXPLORATION TECHNIQUES FOR HYDROCARBON Surface geology, Subsurface geology, Drilling operations
Week 12	MAPS AND CROSS SECTIONS Contour maps, Geologic maps, Cross sections
Week 13	PETROLEUM GEOLOGY OF IRAQ AND SURROUNDING REGIONS 1
Week 14	PETROLEUM GEOLOGY OF IRAQ AND SURROUNDING REGIONS 2
Week 15	Preparatory week before the final Exam
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Basic Petroleum Geology, Peter K. Link	Yes
Recommended Texts	Elements of Petroleum Geology (2nd edition): Academic Press, Toronto,	No
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

Module Information			
معلومات المادة الدراسية			
Module Title	Properties and transportation of crude oil and gas		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	PTCO222		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGII	Semester of Delivery	2
Administering Department	PE	College	OGE
Module Leader	Ramzy. S. Hamied	e-mail	E-mail
Module Leader's Acad. Title	Ass. Prof. Dr	Module Leader's Qualification	PhD
Module Tutor	NA	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	FLME213, CHEM121	Semester	1, 2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	Providing students with science and knowledge in oil and gas different types of transportation as single-phase flow and two-phase flow, Stresses types, study the types of pumps, compressors, legislation and laws relating to the transfer and storage of oil and gas, methods of storage and calculations of economic diameter. Also study the characteristics of crude oil and its products in terms of classification and use Products and methods of obtaining them as well as disposal methods of unwanted compounds in crude oil or its various products (light, medium and heavy).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- To give the student the knowledge in pipeline, horizontal and non-horizontal flow calculation as single and two-phase flow. 2- To give student the knowledge of sizing and specifying pipe, selection of route, protection against corrosion pipe lying. Types of oil and gas transportations. 3- To give student the idea about tanks, pressure vessels, design and selection of storage tanks. 4- To give the student the knowledge and experiments of Petroleum assay (carbon residue, asphaltene content) Density, distillation, Light hydrocarbon, salt content, Sulfur content, Viscosity and pour point. 5- To give student the knowledge of Crude oil properties, Industrial process of distillation towers and fraction processes. 6- To give student the idea liquid petroleum gases (LPG), gasoline blending components, and naphtha, jet fuel, kerosene, and distillates, and Lubricated oil, Residue Fuel Oil, Wax, Asphlitane.
Indicative Contents المحتويات الإرشادية	This course focus to crude oil and gas properties first part then in the second part study oil and gas transportation which make the students through the application of module learning outcomes concepts to develop the problem-solving skills essential to good engineering practice of practical applications of Properties and transportation of crude oil and gas.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1. Lectures. 2- Discussion. 3- Presentations and Listening. 4- Encourage students to team working.
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5- Encouraging students to submit reports on problem and solutions related to the curriculum.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	75	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Source of Oil and classifications, Petroleum assay (carbon residue , asphaltene content) Density, Viscosity, Distillation process, Light hydrocarbon, salt content.
Week 2	Sulfur content, pour point, Properties of Oil Stock, fractional Industries, Industrial process of distillation towers and fraction processes, Basic operation in petroleum processing.
Week 3	Light products and Their properties (Gasoline blending components, and naphtha, Liquid petroleum gases (LPG))
Week 4	Mid-range Oil Products (Jet fuel, kerosene)
Week 5	Heavy Oil products and Their Properties (Residue Fuel Oil, Wax (classification, types) , Lubricants)
Week 6	Methods of Oil and Gas Transportation (single flow calculations) and Pipeline Transportation of single and Multi-phase Flow
Week 7	Efficiency of Pipeline Transportation with other types
Week 8	Multi-phase Flow
Week 9	Horizontal and Non-Horizontal Flow Calculation multi-phase flow
Week 10	Gas Flow in Series, Parallel and Network Pipelines, Gathering pipelines. The SCADA System for pipelines.
Week 11	Pipelines Economics, Pipelines Design, Pipeline networks, Sampling and Testing of Oil and Gas.
Week 12	Pumps and Compressors, Instrumentation and Control, Safety and Supervision.
Week 13	Rules and Regulation in Transportation and Storage of Oil and Gas, Economic pipe diameter.
Week 14	Types of Storage, Underground Storage of Natural Gas
Week 15	Preparatory week before the final Exam
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	density and specific gravity
Week 2	Astm distillation
Week 3	flash and fire point
Week 4	carbon residue and Ash content
Week 5	sulfur content
Week 6	smoke point
Week 7	octane and cetane number

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<p>1- Emir Ceriþc, "Crude Oil , Processes and Products", ISBN (9958917343, 9789958917349). 2012.</p> <p>2- Vasily .S and Raphael. I, Marcel Dekker, "Crude Oil Chemistry", Inc, New York Basel 2005.</p> <p>3- James. G. Speight "Petroleum Chemistry and Refining", Applied Energy Technology Series, Taylor and Francis USA, 1998.</p> <p>4- "Oil and Gas Production Handbook", Havard Devold., Wikipedia (The Free Encyclopedia), 2013.</p>	

	<p>5- “Gas Conditioning and Processing: The Basic Principles”, John. M. C., Robert. A. H., Robert. N. M., Copyright Campbell Petroleum Series USA. 1992.</p> <p>6- “Production and Transportation of Oil and Gas B: Gathering and Transportation (Development in Petroleum Science)”, A. P. Szilas, Elsevier Science Publishing Company 1986.</p>	
Recommended Texts	<p>1- Emir Ceriþc, "Crude Oil , Processes and Products", ISBN (9958917343, 9789958917349). 2012.</p> <p>2- “Oil and Gas Production Handbook”, Havard Devold., Wikipedia (The Free Encyclopedia), 2013.</p>	
Websites		

Grading Scheme				
مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
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Module Information			
معلومات المادة الدراسية			
Module Title	Fluid Mechanics II		Module Delivery
Module Type	Basic		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	FLME223		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	UGII	Semester of Delivery	
Administering Department	PE	College	OGE
Module Leader	Dr. Anwar N. Mohammed Ali	e-mail	10605@uotechnology.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	PH.D.
Module Tutor	Dr. Anwar N. Mohammed Ali	e-mail	10605@uotechnology.edu.iq
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	FLME213	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	This course provides students an information on the principal concepts and methods of fluid mechanics. Topics covered in the course include pipe systems and pipes network,

أهداف المادة الدراسية	fluid measurements(types and their importance), Non Newtonian liquids, dimensional analysis, pumps, flow of compressible fluid, and flow in porous media. Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of these concepts, and to develop the problem-solving skills essential to good engineering practice of fluid mechanics in practical applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> 1- To give the student the knowledge in types of fluid measurements; their importance, principles and applications. 2- To give the students an idea on Non-Newtonian fluids; their types and models, their physical principles of flow, and friction. 3- To give the students an idea on dimensional analysis grouping. 4- To give knowledge on types of pumps and their principles. 5- To make the students release the compressible fluid; their difference from incompressible fluid and how to write their basic equations
Indicative Contents المحتويات الإرشادية	Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of these concepts, and to develop the problem-solving skills essential to good engineering practice of fluid mechanics in practical applications.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	<p>Using the following:</p> <ol style="list-style-type: none"> 1- Discussion. 2- Brain storming by encouraging students to produce a large number of ideas about some issue or problem raised during the lecture. 3- Self-learning by teaching the student by his own according to his special abilities and mental and cognitive levels responding to his preferences and interests to achieve development and integration of his capabilities. 4- Cooperative learning by team working.
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Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	90	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعيا	6
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Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 13	LO #1
	Assignments	2	10% (10)	3, 11	LO # 1 and 4
	Projects / lab	1	10% (10)	15	LO # 1 and 3
	Report	7	10% (10)	2,4,6,8,10,12,14	LO # 1,3 and 4
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1 and 3
	Final Exam	2hr	50% (50)	16	LO # 1 and 3
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Multiple-pipe system Parallel connection, series connection.
Week 2	Multiple-pipe system Reservoir pipe junction, and piping network.

Week 3	<p><u>Flow measurement</u></p> <p>Why it is important? Custody Transfer Measuring System</p> <p>Obstructive devices, and Non-obstructive devices.</p> <p>Pitot tube</p>
Week 4	<p><u>Flow measurement of close channel</u></p> <p>Venture meter, Orifice meter.</p>
Week 5	<p><u>Flow measurement of close channel</u></p> <p>Nozzle meter, Rotameter.</p>
Week 6	<p><u>Flow measurement of open channel</u></p> <p>Weir and Notch.</p>
Week 7	<p><u>Mid Exam</u></p>
Week 8	<p><u>Non- Newtonian liquids</u></p> <p>Introduction, types of Non-Newtonian liquids, apparent viscosity.</p>
Week 9	<p><u>Non- Newtonian liquids</u></p> <p>Velocity distribution.</p>
Week 10	<p><u>Non- Newtonian liquids</u></p> <p>friction factor, and the pressure losses.</p>
Week 11	<p><u>Dimensional Analysis</u></p> <p>The Principle of Dimensional Homogeneity, Why do we need to do dimensional analysis? Dimensionless group using Rayleigh Method.</p>
Week 12	<p><u>Dimensional Analysis</u></p> <p>Dimensionless group using Buckingham Pi Theorem.</p>
Week 13	<p><u>Pumps</u></p>

	Types, application, similarity rules, starting point for one and two pumps connected in parallel or sequence.
Week 14	<u>Compressible fluid</u> Introduction, applications, energy losses of its flow, derivation of sonic equation, supersonic and subsonic flow and the types of measurement.
Week 15	Preparatory week before the final Exam
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Hydraulic bench, Volumetric flow rate measurement.
Week 2	Osborne-Reynolds and laminar flow Demonstration.
Week 3	flow through a Venture meter.
Week 4	Head losses in bends.
Week 5	Energy losses in piping system.
Week 6	Fluid friction in a smooth & roughened pipe/flow measuring and valves.
Week 7	Bourdon manometer calibration (dead weight).

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> • Streeter, V. "Fluid Mechanics", 6th edition, Mc-Graw Hill, 1975 . • Frank M. White "Fluid Mechanics", 5th edition, McGraw Hill. 1997. • Coulson & Richardson's Chemical Engineering - Vol. 1, Fluid Flow, Heat Transfer and Mass Transfer - 6th edition, Butterworth-Heinemann, 1999. • R. C. Hibbeler "FLUID MECHANICS", 2nd edition in SI units, Pearson Education, 2021. 	
Recommended Texts	Frank M. White "Fluid Mechanics", 5th edition, McGraw Hill. 1997.	
Websites		

Grading Scheme				
مخطط الدرجات				
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Module Information			
معلومات المادة الدراسية			
Module Title	Petro physics of Reservoir Engineering		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	PERE224		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGII	Semester of Delivery	
Administering Department	PE	College	OGE
Module Leader	Fadhil S. Khadhim	e-mail	E-mail
Module Leader's Acad. Title	Prof	Module Leader's Qualification	Phd
Module Tutor	NA	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	PRPE112, STGE215	Semester	
Co-requisites module	None	Semester	

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

<p>Module Aims</p> <p>أهداف المادة الدراسية</p>	<p>This module is aiming to:</p> <ol style="list-style-type: none"> 1- Know the fundamentals of reservoir engineering. 2- Know the types of rocks properties. 3- Deal with intervention of rock properties on initial fluid in place estimation and interpretation. 4- How to deal with Darcy law output and interpretation.
<p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p>	<p>To know the rocks Petrophysics properties and related reservoir properties and calculations, which comprised:</p> <ol style="list-style-type: none"> 1. Reservoirs types and classifications 2. Porosity definition and types 3. Darcy low derivation 4. Permeability classifications, definition and types 5. Water saturation determination and types 6. Compressibility types. 7. Capillary pressure, wettability and surface tension. 8. J-function determination and plot. 9. Determination of hydrocarbon in place. 10. Fluid flow regimes in porous media. 11. Determination of fluid contacts from pressure test data.
<p>Indicative Contents</p> <p>المحتويات الإرشادية</p>	<p>Indicative content includes the following:</p> <p>Part I: Reservoirs classification and Rocks Petrophysics properties:</p> <p>In this part, the students will provide by the reservoirs classifications and rocks petrophysics properties such as porosity, permeability, water saturation, J- function, capillary pressure, surface tension, wettability, and compressibility.</p> <p>Part II: Estimation of hydrocarbon in place and fluid flow regimes.</p> <p>In this part, the students will provide by the volumetric method for calculating hydrocarbon in place and three steady state fluid flow regimes for compressible, slightly compressible and incompressible fluids in radial and liner geometries.</p> <p>Part III: Determination of fluid contacts from pressure test data.</p> <p>In this part, the students will provide by the pore pressure types and graphical method for determination fluid contacts.</p>

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in delivering this module is to Encourage students to ask and answer questions, as well as presenting many explanatory videos to increase students' knowledge, and also to introduce the student to the most important petroleum terms, abbreviations and symbols that he will need to complete the rest of the academic stages Or to work in the future as an oil engineer.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	75	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

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

assessment	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction
Week 2	Reservoirs Classification
Week 3	Porosity
Week 4	Permeability
Week 5	Average and absolute permeability
Week 6	Fluid Saturation Determination and Initial Saturation Distribution in a Reservoir
Week 7	Rock compressibility, wettability, Surface tension and capillary pressure
Week 8	J- Function, and Formation Resistivity
Week 9	Hydrocarbon In place Calculations
Week 10	Fluid Flow Regimes in Porous media
Week 11	Compressible fluid flow in radial and linear Geometry
Week 12	Incompressible fluid flow in radial and linear Geometry
Week 13	Slightly Compressible fluid flow in radial and linear Geometry
Week 14	Fluids Contact Identification
Week 15	Preparatory week before the final Exam
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Core analysis, cutting and preparation
Week 2	Core Cleaning and Drying
Week 3	Calibration of Pressure Gauge
Week 4	Bulk Volume Measurement for Regular Cores
Week 5	Bulk Volume Measurement for Regular Cores
Week 6	Bulk Volume Measurement for Irregular Cores
Week 7	Porosity Measurement by Mercury Injection
Week 8	Porosity Measurement by Air Injection
Week 9	Porosity Measurement by Water Injection
Week 10	Fluid Saturation Measurement
Week 11	Permeability Measurement by Water Flowing
Week 12	Permeability Measurement by Gas Flowing
Week 13	Capillary Pressure Measurement
Week 14	Grain volume Measurement
Week 15	Density Measurement
Week 16	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> 1. J.H. Schon , (Physical Properties of Rocks), Elsevier, Oxford, UK. 2011 2. Kadhim F.S., and Samsuri A. Cementation Factor Relationships to Carbonate Rock Properties, Lambert Academic Publication, Germany, 2015. 3. Amyx, J.W., Bass, D.M., Jr., and Whiting, R.L.: Petroleum Reservoir Engineering, Physical Properties, McGraw-Hill, New York, 1960. 4. Towler, B.F.: Fundamental Principles of Reservoir Engineering, SPE Textbook Series Vol. 8 (2020) 	No
Recommended Texts	<ol style="list-style-type: none"> 1. Ahmed T. Reservoir Engineering Handbook, 2010. 	Yes
Websites		

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

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

Module Information معلومات المادة الدراسية			
Module Title	Physics and Thermodynamics		Module Delivery
Module Type	Basic		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	PHTH225		
ECTS Credits	5		
SWL (hr/sem)	130		
Module Level	UGII	Semester of Delivery	
Administering Department	PE	College	OGE
Module Leader	Prof. Dr. Najem Al-Rubaiey		e-mail E-mail: 100108@uotechnology.edu.iq
Module Leader's Acad. Title	Prof.	Module Leader's Qualification	PhD
Module Tutor	2	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	OPDE212		Semester
Co-requisites module	1- It provides abroad foundation in the basic of science and engineering.		Semester

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	<ol style="list-style-type: none">1. The program has a strong emphasis on modern physics and its application to 21st century technology.2. Our program builds on the existing research and teaching strengths of the Physics and Materials Science Division in cross-cutting areas such as novel 21st century materials, materials for energy, macromolecules, quantum mechanics to devices, surfaces, interfaces, and nanostructures, and computation, and is flexible enough to grow together with the research base of our division.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none">1- Graduates will have substantial experience with laboratory methods, data analysis, and computation.
Indicative Contents المحتويات الإرشادية	Engineering physics students will be well equipped to pursue research and development careers in new and emerging technologies such as properties of new materials, quantum electronics, nanofabrication and devices, quantum signal processing and quantum computing, related to emerging advances in electrical, mechanical and petroleum engineering.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Active learning techniques methods
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	130		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	History of nature science, electrical, charge, current.
Week 2	Resistance, resistivity, galvanometer, ammeter, voltmeter.

Week 3	Simple harmonic motion.
Week 4	Kinetic and potential energy
Week 5	Electric and magnetic properties of matter
Week 6	Insulators, semiconductor, conductor, superconductor.
Week 7	Diamagnetic, paramagnetic, ferromagnetic
Week 8	Nanotechnology
Week 9	Introduction: Zeroth law of thermodynamics: Definition of temperature, Zeroth law concept, Type of thermometers, Type of temperature scales, Kelvin experiment: gas thermometer
Week 10	Ideal gas Equation: Properties of matter, Temperature effect on matter, Thermal expansion laws Macroscopic description of ideal gas, Derivation of Ideal gas equation
Week 11	Heat: Heat and internal energy, Units of heat, Mechanical equivalent of heat, Specific heat capacity, Calorimetry, Latent heat Work: State variables, Transfer variables, Work in thermodynamics, PV diagrams, Energy transfer .
Week 12	The 1st law of thermodynamics: Isolated and open systems, Adiabatic processes, Adiabatic free expansion process Isobaric processes, Isochoric processes, Isothermal processes, Thermal expansion
Week 13	Engines and refrigerators: Work to heat, Heat engine, Thermal efficiency of heat engine, Heat pump (refrigerators), Refrigerator cycle (Sterling), Coefficient of performance
Week 14	2nd law of thermodynamics: Entropy Kelvin-Planck & Clausius forms, Reversible and irreversible processes Carnot engine and theorem, Carnot efficiency
Week 15	Preparatory week before the final Exam
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Electric Charge and Field, Guide to Semiconductor Engineering, Magnetic and Electric book. Publish Papers	Yes
Recommended Texts	Physics text book, Series of nanotechnology	
Websites	Elsevier, Springer, Physics library online, https://openlibrary.org/subjects/physics ,	

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 Information معلومات المادة الدراسية			
Module Title	Partial Differential Equations		Module Delivery
Module Type	Basic		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	PADE226		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UGII	Semester of Delivery	
Administering Department	PE	College	OGE
Module Leader	Jassim M. Al Said Naji	e-mail	E-mail: 150100@uotechnology.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	2	e-mail	E-mail
Peer Reviewer Name	Dr. Fadhil S. Kadhim	e-mail	150010@uotechnology.edu.iq
Scientific Committee Approval Date	01/06/2023	Version Number	1.0
Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ORDE212	Semester	3
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	Important objectives of the calculus sequence are to develop and strengthen students' problem-solving skills and to teach them to

<p>أهداف المادة الدراسية</p>	<p>read, write, speak, and think in the language of mathematics. In particular, students learn how to apply calculus tools to a variety of problem situations.</p>
<p>Module Learning Outcomes</p> <p>مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> 1. Find limits of functions (graphically, numerically, and algebraically) 2. Analyze and apply the notions of continuity and differentiability to algebraic and transcendental functions. 3. Determine derivatives by a variety of techniques including explicit differentiation, implicit differentiation, and logarithmic differentiation. Use these derivatives to study the characteristics of curves. Determine derivatives using implicit differentiation and use them to study the characteristics of a curve. 4. Students will use a variety of methods to solve the Laplace and Poisson equations. 5. Harmonic function characteristics will be examined by the students. 6. The heat and wave equations will be solved, and students will examine their characteristics. 7. The characteristic approach will be used by students to resolve first order partial differential equations. 8. Students will evaluate conservation laws' characteristics. 9. Students will examine some other nonlinear PDEs' properties if time allows.
<p>Indicative Contents</p> <p>المحتويات الإرشادية</p>	<ol style="list-style-type: none"> 1. To model and comprehend scenarios involving exponential growth or decay and second order physical systems, use established DE types. 2. Use a variety of input functions, such as zero, constants, exponentials, sinusoids, step functions, impulses, and superpositions of these functions, to solve the major equations. 3. Use the characteristic equation, exponential response formula, Laplace transform, convolution integrals, Fourier series, complex arithmetic, parameter variation, elimination, and anti-elimination methods to solve the differential equations mentioned above. 4. Be able to solve linear DEs using the fundamental ideas of

	linearity, superposition, and the existence and uniqueness of DE solutions.
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	<ul style="list-style-type: none"> • Highlight conceptual comprehension. • Assign homework that is difficult and builds on the lessons you gained in class. • Cooperative learning strategies ought to be applied. • Submit intelligent queries. • Put your focus on logical reasoning and practical problem-solving. • Use a range of assessment techniques.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	75	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #3 and 10
	Assignments in collage	10	10% (10)	Continuous	All
	Assignments in home	10	10% (10)	Continuous	All

	Report	1	10% (10)	13	LO # 5
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	- General Review
Week 2	- Special Functions I
Week 3	- Special Functions I
Week 4	- Fourier Analysis and Series
Week 5	- Fourier Transform I
Week 6	- Inverse of Fourier Transform
Week 7	- Laplace Transform
Week 8	- Inverse of Laplace Transform
Week 9	- Methods of Solving PDE: (Direct integration method, Variables separable, Fourier Transform, Laplace Transform, ODE methods)
Week 10	- One Dimension Heat Equation, Two Dimension Heat Equation (Laplace equation) by Variable separable
Week 11	- One Dimension Heat Equation, Two Dimension Heat Equation (Laplace equation) by Transforms
Week 12	- One Dimension Wave Equation by Variable separable, Wave Equation: D. Alembert's formula
Week 13	- One Dimension Wave Equation by transforms
Week 14	- Single Phase Fluid Flow Equation Solution
Week 15	- Final Exam
Week 16	- The preparatory week before the Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<p>1- George B. Thomas, "THOMAS' CALCULUS ", Eleventh Edition 2011, Dorling Kindersley (India).</p> <p>2- Spiegel, M. R. Schaums outline series, theory and problems of Lablace transform, copy write 1965 by Mc Graw-Hill Inc.</p> <p>3- Spiegel, M. R. Schaums outline series, theory and problems of Fourier analysis with application to boundary value problem, copy write 1974 by Mc Graw-Hill Inc.</p>	
Recommended Texts	<p>1- Ford , S.R. and Ford , J.R. " Calculus " , (1963) McGraw-Hill.</p> <p>2- K.Back house and S.P.T. Houldsworth " Pure Mathematics a First Course " (1979) , S1 Edition , Longman Group .</p> <p>3- Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons. Inc., 9th ed., 2006.</p>	
Websites	<p>1- https://en.wikipedia.org/wiki/Differential_equation</p> <p>2- https://byjus.com/maths/differential-equation/</p>	

Grading Scheme

مخطط الدرجات

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