	Ministry of Higher Education and Scientific Research - Iraq University of Warith Al_Anbiyaa.... College of Engineering Oil and Gas Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	Geophsysics and Rock Mechanics		**Module Delivery**
Module Type	Basic learning activities		☒ **Theory**
Module Code	OGE315		☐ **Lecture**
ECTS Credits	5		☐ **Lab**
SWL (hr/sem)	125		☐ **Tutorial** ☐ **Practical** ☐ **Seminar**

Module Level	UGIII	**Semester of Delivery**	5
Administering Department	OGE	**College**	ENG
Module Leader	Salam Khalid	**e-mail**	Salam.khalid@uowa.edu.iq
Module Leader's Acad. Title	Asst.Lect.	**Module Leader's Qualification**	MS.C
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	**OGE221**	**Semester**	4
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	• Students will have learned all about exploration geophysical methods and the earth physical properties, how to measure, processed and interpret field data. • They will have the ability to calculate seismic wave velocity, layers depth and lithology type. Translate time seismogram to depth seismogram • Recognize between structure and stratigraphic features in the seismogram with detect hydrocarbon indicators. • Introduction to rock mechanics, and related to petroleum engineering
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The student will have the ability to read final stack seismogram, make structure and stratigraphic interpretation with detect hydrocarbon indicators (HCI) (bright, flat and dim) spots. Determine lithology using seismic and acoustic velocity from both horizontal and vertical exploration method. Petroleum related rock mechanics, Introduction Physical properties of rocks , Deformation of rocks
Indicative Contents المحتويات الإرشادية	Indicative contents includes the following: Introduction Physical properties of rocks. Type of subsurface exploration methods depending on rock physical properties. Learned about the best geophysical method that can used in oil and gas exploration Determine the layers that contain fluids depth thickness and type of fluid.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategies that will be adopted in delivering this module are including information of geophysical methods in general, and their characterization and specifications of properties. Starting from basic various geophysical principles and methods used in revealing shallow to deep interior of the earth, carry out geophysical surveys and making choice of methods in the exploration of oil and gas, the instrument that use in the field and the ability to collect, analyze and interpret various data. seismic method (refraction and reflection), seismic waves type, theory of elasticity, type of sound wave velocity and how we use it to recognize lithology type, take all the principles and equations that the student need to calculate layers velocity and depth.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
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	• Introduction to Geophysical Science and Technology • Exploration Methods (Seismic, Gravity, Magnetic, Electric, Radioactivity) Instruments, Applications and Principles Depend On It with Interpretation the Result
Week 2	• Theory of elasticity and Fundamental conditions • Stress component and Strain Types • Hooke's law for isotropic media • The elastic moduli(Young's modulus E, The shear modulus μ, Poisson's ratio σ, Lames elastic coefficients λ, The bulk modulus B) • Mathematical interrelationships of elastic moduli
Week 3	• Seismic waves • Classification of the common seismic waves • Body wave(primary and secondary waves) • Surface waves (love and Rayleigh waves) • wave terminology • concept of Wave fronts • Huygens's Principle • Plane wave propagation according to Huygens principle • Concept of the interface • Acoustic impedance • Snell's law • the critical refraction angle equation • Reflection coefficient • Transmission coefficient
Week 4	• Seismic Waves Velocity • Factors affecting seismic velocity • Rock lithology type • Calculate Poisson's ratio (σ) from seismic wave velocity • Calculate seismic wave velocity from elastic moduli • Type of velocity function
Week 5	• calculating reflection velocity using Normal Move out methods • calculate layers depth (for horizontal and dipping layers)

	• Seismic refraction method • Refraction data acquisition • First break picking for good and poor data • calculate intercept time and critical distance • calculating refraction velocity • Calculate layers depth (for two , three and four layers) for horizontal and dipping layers.
Week 6	• Interpretation of Seismic Reflection Data(Seismic Structural Interpretation) • Seismic structure interpretation tools • Seismic structure interpretation features type (folding ,faulting and horizontal reflection horizon) • The Important of Isopach Maps, Time Map, Depth Map and Velocity Maps) (Result a Depth Maps From Time Maps)
Week 7	• Interpretation of Seismic Reflection Data(Seismic Stratigraphic Interpretation) • Seismic Stratigraphic interpretation tools • Basic Stratigraphic Concepts • Reflection configuration patterns • Seismic Stratigraphic features type (salt domes, reefs, Sand Lenses and Unconformity)
Week 8	• hydrocarbon indicator (HCI) • (HCI) tools (waveform parameters, as amplitude, frequency, phase, and propagation velocity) • (HCI) types (bright, flat and dim spots)
Week 9	• Introduction Physical properties of rocks • Stresses and strains
Week 10	• Thermal and hydraulic properties of rocks • Deformability properties of rocks and rock masses
Week 11	• Applications of theory of elasticity in rock mechanics • Seismic rock properties
Week 12	• Seismic wave propagation • In situ stresses
Week 13	• Strength properties of rocks and rock masses • Rock discontinuities
Week 14	• Visco-elasticity and rocks
Week 15	• **Hemispherical projection methods** • **Biot-Gassmann rock model**
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		Yes
Recommended Texts	1- Alsadi H.N. "Seismic Hydrocarbon Exploration 2D and 3D Techniques" Springer International Publishing Switzerland 2017, 341p. 2- Telford, W. M., Geldart, L. P., Sheriff, R. E., 1990," Applied Geophysics" 2nd edition, Cambridge University press, 770 p. 3- Petroleum related rock mechanics /Erling Fjar, Holt Horsrud, Aren Raaen and Rasmus	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.