MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Geology of Iraq**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-36029**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		**UG 3**	**Semester of Delivery**		6
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Mahfoudh Abdulla Ali		**e-mail**	mahfoudhali@uomosul.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Mahfoudh Abdulla Ali		**e-mail**	mahfoudhali@uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		23/04/2024	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Stratigraphy	**Semester**	5
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. Clarification the tectonic position of Iraq and its relationship with Middle East. 2. Explain the effected of plate tectonic in Iraqi stratigraphic succession , tectonic division and its geological history . 3. Study the tectonic division of Iraq. 4. Study lithological facies and formations distribution from the stratigraphic succession of Iraq. 5. Explain the vertical and horizontal relationships among sedimentations and formation in Iraq. 6. Learn about economic importance from Iraqi sedimentations successions
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	number of study weeks. 1. List with description, the tectonic division of Iraq. 2. Define the various terms associated with geology of Iraq. 3. What is TMS? Definition, and what importance in geology of Iraq. 4. Explain the relationships between plate tectonic and stratigraphic succession in Iraq. 5. List and Describe the Ecology and distribution of formations in Iraq. 6.Define active margin, passive margin, Wilson cycle. 7. Discus the relationships between passive margin and hydrocarbon accumulation. 8. List the formations have economic importance in Iraq. 9. Terminology.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction, Some Basic Information on the Position and Structure of Iraq, boundaries of Arabian plate, Tectonic Divisions of Iraq according to Jassim and Goff (2006), Stable shelf Units, Unstable shelf Units, Zagros suture Units, Development of Arabian Plate, Margins of Arabian plate, Tectonostratigraphic megasequence: TMS, TMS Ap1, TMS Ap2, TMS Ap3, paleogeography in Early Paleozoic, TMS Ap4, TMS Ap5, Active Margin And Back-Arc Basin, TMS Ap6, [10 hrs]. Opening of the Neo-Tethys, first Passive Margin, stratigraphy and paleogeography, TMS Ap7, Opening of the Mediterranean Basin, created the 2nd passive margin, sedimentation, TMS Ap8 of Pre-Ophiolite Obduction, Third Passive Margin, TMS Ap9, ophiolite obduction, unconformity between Mesozoic and Cenozoic, onset of the foreland basin, [8 hrs]. TMS Ap10, closure of Neo-Tethys, Development of the foreland basin, TMS Ap11, Arabia/Eurasia collision, stratigraphy and Paleogeography, The upper boundary is the present topographic surface. [3 hrs] <u>Part B – Practical labs</u> Explain the sedimentary environment and sedimentary cycles, Stratigraphic

	succession from Paleozoic in Iraq, Stratigraphic succession from Triassic in Iraq, Stratigraphic succession from Jurassic in Iraq, Stratigraphic succession from L. Cretaceous in Iraq, Stratigraphic succession from U. Cretaceous in Iraq, Stratigraphic succession from Paleogene in Iraq, Stratigraphic succession from Neugene in Iraq, Stratigraphic succession from Quaternary in Iraq. [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expanding students' perceptions about the tectonic position of Iraq and its relationship with Middle East and the plate tectonic from the world. In addition to the learn the stratigraphic distribution and paleoenvironmental condition of Iraqi formations through geological history. This will be achieved through lectures, labs, and interactive tutorials and by types of practical exercise and field work trips by student to the Surface successions of formations in country.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري	
	Material Covered
Week 1	**Some Basic Information on the Position and Structure of Iraq.**
Week 2	**Jassim and Goff (2006) classification of Tectonic position of Iraq.**
Week 3	**Geology of Iraq During the Geologic time TMS AP1.**
Week 4	**Geology of Iraq During the Geologic time TMS AP2.**
Week 5	**Geology of Iraq During the Geologic time TMS AP3.**
Week 6	**Geology of Iraq During the Geologic time TMS AP4.**
Week 7	**Geology of Iraq During the Geologic time TMS AP5.**
Week 8	**Geology of Iraq During the Geologic time TMS AP6.**
Week 9	**Geology of Iraq During the Geologic time TMS AP6 and TMS AP7.**
Week 10	**Geology of Iraq During the Geologic time TMS AP7.**
Week 11	**Geology of Iraq During the Geologic time TMS AP8.**
Week 12	**Geology of Iraq During the Geologic time TMS AP9.** .
Week 13	**Geology of Iraq During the Geologic time TMS AP10.**
Week 14	**Geology of Iraq During the Geologic time TMS AP11.**
Week 15	**Oil distribution in Iraqi formations.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Explain the sedimentary environment and sedimentary cycles.
Week 2	Lab 2: Stratigraphic succession from Paleozoic in Iraq.
Week 3	Lab 3: Stratigraphic succession from Paleozoic in Iraq.
Week 4	Lab 4: Stratigraphic succession from Triassic in Iraq.
Week 5	Lab 5: Stratigraphic succession from Triassic in Iraq.
Week 6	Lab 6: Stratigraphic succession from Jurassic in Iraq.
Week 7	Lab 7: Stratigraphic succession from Triassic in Iraq.
Week 8	Lab 8:. Stratigraphic succession from L. Cretaceous in Iraq.

Week 9	Lab9: Stratigraphic succession from U. Cretaceous in Iraq.
Week10	Lab 10: Stratigraphic succession from Paleogene in Iraq.
Week 11	Lab 11: Stratigraphic succession from Neogene in Iraq.
Week 12	Lab 12: Stratigraphic succession from Quaternary in Iraq.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Jassim, SZ. and Goff, JC.(2006)**. *Geology of Iraq. Czech Republic, Dolin, Prague and Moravian Museum, Brno*, 341p. **Bellen, R.C. van, Dunnington, H.V., Wetzel, R. and Morton, D.(1959).** *Lexique Stratigraphique International. Asie, Iraq, Fasc. 10a, Paris*, 333p. **Sharland, P.R., Archer, R., Casey, D.M.,Davies, R.B., Hall, S.H., Heward, A.P., Horbury, A.D. and Simmons, M.D.(2001**). *ARABIAN PLATE SEQUENCE STRATIGRAPHY, GeoArabia Special Publication 2, Gulf Petro Link, Bahrain, 372p.*	Yes Yes
Recommended Texts	**Aqrawi, A.A.M., Goff, J.C., Horbury, A.D., and Sadooni, F.N. (2010). The petroleum Geology of Iraq, Scientific press Ltd. 424p.**	Yes yes
Websites	Iraqi Academic Scientific Journals: https://www.iasj.net/	

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	**Structural Geology II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-36125**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rabeea Kh. Znad		**e-mail**	rabeeazinad@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr.Saddam Essa Mustufa Mahmood Abdulhaq Alsumaidai		**e-mail**	saddammostafa@uomosul.edu.iq mahmodabdhaq@uomosul.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	Structural Geology I	**Semester**	5
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. The course includes the essential information on geological brittle failure structures including joints,Fault,viens and balance cross section.. 2. complete description and analysis of the course vocabulary. 3. Study the modes of rocks deformation responses. 4. The theoretical information is supported by practical work for three hours a week using Stereographic technique (Schmidt and Polar Nets) to resolve various structural exercises.
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.Students will learn joints definition, importance in geology . 2. Learn the joints types and modes formations. 3.Aable to classify joints according to different parameters. 4.Distingwish between tension and shear joints 5.learn to measure the attitude if joints in the field. 6.Define the relationship between joints and folds. 7.Students will lean faults definition,impotance in geology. 8. Learn the faults terminology and types. 9. Able to identify faults in the field. 10.Define the relationship between faults types and stresses axes. 11. Making balance cross section and calculate the shortening ratio. 12. The student will be able to deduce the orientations of paleostresses that generated these structures. And applications in geology and engineering programs.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Theoretical lectures. Introduction to geological structures, genetic and geometric classification of joints. Attitude of joints , joints in the field, academic and economic importance of joints, faults types and various classifications modes, field criteria of faults, faults and it relation with principal stress axes. Balance cross section concept and measure of shortening ratio. Part B – practical labs. Fundamentals and idea of stereographic projection . how are the equal area and equal angles nets construct and the difference between them. procedure of precise methods for plotting planar and linear structures, analyses of fractures and folds using stereographic projection, rotation data about various lines dipping ,restoration of tilt of beds, geotechnical application(rock slope stability)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	Expanding students' perceptions about this science and its contents it includes that help in structural geological, , and paleostress analyses. In addition to the use of different field methods in distinguishing the types of joints ,faults and viens in order to evaluate site investigations for slope stability and other purpes. This will be achieved through lectures, labs, field trips and interactive tutorials .

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
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**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 to brittle failure fractures. definition and importance.
Week 2	Types of joints ,attitude of joints, joints classifications-geometrical and genetic.
Week 3	Fractures(joints) from experimental data.
Week 4	Relation of joints with folds.
Week 5	Faults, general characteristics, parts of fault, faults types.
Week 6	Faults classification according top various parameters.
Week 7	Principals stresses axes and faults types, faulting critera.
Week 8	Geomorphic criteria of faults,
Week 9	Types of faults systems and lithospheric plates boundaries, normal fault plane system according to profile apperances. Normal faults and sedimentation.
Week 10	Reverse fault systems, thrust systems leading ,trailing and duplex thrust structures.
Week 11	Strike slip fault system- Left-hand (sinistral)- Right-hand (dextral)- En-echelon pattern of strike slip faults- Left en-echelon- Right en-echelon-Compressional tectonic environment- Left hand shear- Right hand en-echelon- Extensional tectonic environment- Left hand shear- Left hand en-echelon-
Week 12	Transpression and Transtension- Left hand shear- Right hand bend- Left hand shear- Left hand bend- Right stepping right lateral fault- Transtension- Pull apart basin- Negative (Normal) flower structure- Left stepping right lateral fault- Transpression- Push(uplift)- Positive (Reverse) flower structure
Week 13	Balance cross section ,conditions for viable cross section,calculate shortenting ratio.
Week 14	Unconformities types and primary structures.
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction of stereographic technique. Theoretical basis. Schmidt or lambert equal-area net.Stereographic or wallf net.
Week 2	Geological structres of planar type Geological structures of linear type. Precise method of Plotting steps of line and planes on equal area net

Week3	Plotting a line that lies in a plane.
Week 4	Determining the between two lines. Line of intersection of two plane
Week 5	True strike and dip from two apparent dips. True dip from strike and apparent dip Attitude of intersection of two planes.
Week 6	Determining the angles between two planes. Pole of plane.
Week 7	Determining the angles between a line and a plane. Bisecting the angles between two lines.
Week 8	Bisecting the angles between two planes .determining the orthographic projection of a line on a plane.
Week 9	Use of equal are net involving rotation. Rotation of line. Projection of cone.
Week 10	Small circle rotation of planes. . Two tilt problems.
Week 11	Rotation of drill-core data. Using the data from the three drill holes shown below, determine the attitude of bedding.
Week 12	Stereographic analyses of folded rocks. Beta and Pi diagrams
Week 13	Stereographic analyses and classification of fractures .paleostress analyses.
Week 14	Preparatory week before the final Exam.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Ramsay, J. G., 1967.** Folding and Fracturing of rocks. McGraw-Hill book Co., New York, 568p. **Billings, M.P., 1972.** Structural Geology, 3rd ed. Prentice-Hall, USA.606p. **Ragan, D.M.,1983.** Structural Geology:An Introduction to geometricalTechniques, JohnWiley&Sons,New York,393p. **Van der Pluijm, B.A. and Marshak, S., 2004**. Earth structure: An Introduction to Structural Geology and Tectonics. WCB/McGraw Hill, USA, 495p. **Davis G. H. and Reynolds S. J., Kluth F.Charles., 2006**. Structural Geology of Rocks and Regions **Stephan M. Rowland.2007.**Structural Analyses and Synthesis .third edition .	Yes

	Ricard J. Lisle and Peter R. Leyshon.2004.Stereographic Projection Techniques for Geologists and Civil Engineers.	
Recommended Texts	**Twiss, R. J. and Moores, E. M., 2007.**Structural Geology. W.H. Freeman, USA, 717p. **Fossen Hakkon (2010), Structural Geology,** Cambridge University Press.480p. **Ramsay, J. G and Huber, M. I., 1987**. The Techniques of Modern Structural Geology. V.2, Folds and Fractures. Academic press, London, 700p.	yes
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Field geology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-36026**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	**Saddam Essa Mostafa Al-khatony**		**e-mail**	saddammostafa@uomosul.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr.Mahmood Abdulhaq Alsumaidai Dr.Rabeea kH. Znad Madyan Raad Ghazal		**e-mail**	mahmodabdhaq@uomosul.edu.iq rabeeazinad@uomosul.edu.iq midian680@uomosul.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	Petrology Structural geology Stratigraphy	**Semester** **Semester** **semester**	4 5 5
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. Clarification of how Field geology can make significant contributions to a vary disciplines in geosciences. 2. Identify Field methods which are useful in Geological Survey. 3. This course deals with the basic concept of the most important Geological Field work with complete and Analysis of the course Vocabulary. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand the impact of these material course in Structural geology, Stratigraphy and Petrology. 6. To perform different improving students' skills in performing their field tests.
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. List with description, the geological formation. 2. Define the two types of geological compass (Silva and Brunton) 3. Define the various terms geological field work. 4. Definition of geological map terms and cross section. 5. Determine the map orientation and different procedures for precise location on the map. 6. Summarize what is meant by travers lines and dip and strike for beds site location. 7. Discuss the geological history and involvement of sequential events in the studied area reginal northern of Iraq . 8. Explain the different ways for true thickness measurement bedding plane or formations. 1. List and describe the different type of rocks and formations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Theoretical lectures. Introduction to field geology. Outline and Approach of Field Behavior. Relation with other geosciences. Types of Geological maps and Base Maps. Methods of Position Finding on Maps. Methods of geological mapping. Traversing types-controlling traverse. Description rocks in the field. Determination of top of beds by sedimentary structures. Descriptive fold elements in the field, Part B – practical labs. Introduction - using of compass (Silva and Brunton). Fundamentals of geological mapping. Geological Maps and draw of geological cross section. Find of strike and true dip from two apparent dip. Speculation the attitude of the strike and dip from figures and diagrams. Determine and draw attitude of the strike and dip on the figures and diagrams. Find slope and gradient for strata. three-point problem.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expanding students' perceptions about this science and its contents it includes that help in Field work, Structural geology, historical of study area and methods analysis. In addition to the use of different of the ways in distinguishing the types of Geological maps through observations in the field and laboratory. This will be achieved through lectures, labs, and interactive tutorials and by types of practical determine methods for measure of true thickness. In the laboratory, students are trained to read and interpret geological maps, as well as drawing cross sections. In the theoretical and scientific aspects, illustrations and computer programs are used to communicate ideas clearly. For the purpose of students acquiring field skills, several geological trips are required in addition to the summer application in which students practice geological survey methods and field descriptions of geological formations and geomorphological and structural features.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 - Outline and Approach of Field Behavior . Field Equipment-- Hammers and Chisels, Compasses and Clinometers, Handlenses, and Other Instruments. Safety requirements
Week 2	Geological Maps and Base Maps I-Types of Geological Map II-Topographic Base Maps
Week 3	Geologic Cross-Sections III- Methods of Position Finding On Maps. Magnetic declination
Week 4	Methods of geological mapping -Traversing types-controlling traverse -following contact -Structures contour map. And other types of geological maps.
Week 5	Description rocks in the field -Sedimentary –Metamorphic and Igneous rocks.
Week 6	Determination of top of beds by sedimentary structures.
Week 7	Syn- sedimentary folds and faults (field characteristics)
Week 8	Thickness beds determination.
Week 9	Find true thickness
Week 10	Unconformities types.
Week 11	Use of primary geological structures in determine way up direction
Week 12	Division of Geological Structures
Week 13	Surfaces and lines
Week 14	Guidelines For Reports
Week 15	Review and prepare for an exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1& week2	Introduction - using of compass (Silva and Brunton).

	Horizontal and vertical strata. Determine the boundary of strata.
Week3	Geological Maps and draw of geological cross section
Week 4	Find of strike and true dip from two apparent dip
Week 5	Speculation the attitude of the strike and dip from figures and diagrams
Week 6	Determine and draw attitude of the strike and dip on the figures and diagrams
Week 7	Find slope and gradient for strata
Week 8	Three-point problem
Week 9	Transfer map measure from linear to digital and contrarily.
Week 10	Find of the true Thickness beds determination.
Week 11	Unconformities types. Field reports writing.
Week 12	training on the theodolite and level stage
Week 13	Preparatory week before the final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**John W. Barnes and Richard J. Lisle, 2004. Basic Geological Mapping, John Wiley& Sons , Ltd, 198pp.** **Angela L. Coe, Tom W. Argles, David A. Rotheryand Robert A. Spicer, 2010 . Geological Field Techniques, A John Wiley & Sons, Ltd., Publication, 337pp.** **McClay, K. (2003) The Mapping of Geological Structures. 2nd edn, The Geological Field Guide Series. Chichester, Wiley.161p.** **Tucker, M. (2003) Sedimentary Rocks in the Field. 2nd edn, Chichester,Wiley.** **And other internet website .**	Yes
Recommended Texts	Physical geology. — Fifteenth edition / Charles C. Plummer, Emeritus of California State University at Sacramento, Diane H. Carlson, California State University at Sacramento, Lisa Hammersley, California State University at Sacramento. 2016. Rowland, S.M., Duebendorfer, E.M. and Schiefelbein, I.M. (2007) Structural Analysis and Synthesis; A Laboratory Course in Structural Geology, Blackwell, Oxford. Geologists' Association (2000) Geological Fieldwork Code, Leaflet, http://www. geolsoc.org.uk/gsl/site/GSL/lang/en/page2542.html.	yes
Websites	https://www.soest.hawaii.edu/martel/Courses/GG303/	

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	**Ore Geology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	GEO-47134				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		**UGIV**	**Semester of Delivery**		**Seven**
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Oday Mohammed Salih Othman		**e-mail**	odayothman@uomosul.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		M.A.
Module Tutor	Nam		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Geochemistry	**Semester**	**Five**
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. Clarification of how ores originate in nature which can make significant contributions to a mineral exploration in geosciences. 2. Identify the types of ores in nature which are useful in identifying their location 3. The student will know many types of ore deposits especially metallic ores, their characteristics, shapes, and geneses. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. Using some geological methods to measure the temperatures and pressures at which the ores are formed, in order to determine the areas of their presence
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. Defining some important terms related to the ores , such as Ore grade, Cut-off grade ,etc. 2. identify The various processes that have given rise to ore-deposits . 3. How magma and magmatic fluids move . 4. Classify the magmatic ore deposits and what are the minerals and rocks associated with them 5. Explain Factors affecting the formation of Metasomatic Ores . 6. Define the Hydrothermal Ore Deposits and what are the types of hydrothermal fluids 7. Discuss How large volumes of fluid can move around at deep levels in the earth's crust, where rocks are highly compacted and have low permeability? 8. Explain theTypes of alteration and their ore association 9. Explain the Genesis of metamorphic graphite. 10. Define the Placer ore-deposits and what are the Types of them
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures Introduction, Economic Geology, Ore geology, Principal steps in the exploitation of ore, Factors affecting the value of cut-off grade, Ore genesis, Magmas and Magmatic fluids, Early and Late magmatic ore-deposits . [*13* hrs] Metasomatism, Stages of Formation of Metasomatic ores, Factors affecting the formation of Metasomatic Ores, Origin (types) of hydrothermal fluids, The Movement of Hydrothermal Fluids, Types of processes of hydrothermal ore deposition. [*10* hrs] Types of alteration and their ore association, Metamorphic ores, Metamorphosed ores, Submarine Exhalative and Volcanogenic oredeposits, Major types of chemical sedimentary ores, evaporates ore deposits, Placer ore-deposits . [*13* hrs] Revision problem classes [3 hrs]

	Part B – Practical labs Physical Properties of Few Common Ore Minerals , Concentration Factor (C.F.), Lazky's Law, Nature of the Ore-bearing hydrothermal fluid and the form in which metals are transported in these fluids [18 hrs] Methods of determination the temperature & pressure. One of these methods is using certain sulfide minerals (Geothermometry and Geobarometry) , Methods of determination the temperature & pressure / Stable isotopes (sulfur isotopes), Methods of determination the temperature & pressure / Stable isotopes (Isotopes of oxygen and hydrogen). [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expanding students' perceptions about this science and its contents it includes that help in Clarification of how ores originate in nature which can make significant contributions to a mineral exploration , In addition to solving some issues related to ores, including knowing the grade of ore for their economic evaluation, as well as estimating the conditions for the formation of ores in nature (temperature and pressure) using some of the methods used for this purpose, through some mathematical problems and laws related to the subject.

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

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري	
	Material Covered
Week 1	Definition and Basic Concepts in Ore Geology
Week 2	Factors affecting the value of cut-off grade
Week 3	Magmatic Ore-deposits
Week 4	Classification of magmatic ore-deposits
Week 5	Contact Metasomatic Ore Deposits
Week 6	Factors affecting the formation of Metasomatic Ores
Week 7	Hydrothermal Ore Deposits
Week 8	Factors affecting fluid flow at a crustal scale
Week 9	Types of alteration and their ore association
Week 10	Ore deposits formed by regional metamorphism and Submarine Exhalative
Week 11	Formation of sedimentary ore deposits by sedimentation and Chemical precipitation from surface waters
Week 12	Formation of sedimentary ore deposits by mechanical weathering (Placer ore-deposits)
Week 13	Formation of sedimentary ore deposits by chemical weathering (Residual sedimentary ore-deposits)
Week 14	Supergene Enrichment (Oxidation and Secondary Supergene Enrichment ores)
Week 15	**Formation of sedimentary ore deposits by evaporation (evaporates ore deposits)**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Physical Properties of Few Common Ore Minerals
Week 2	Concentration Factor (C.F.)
Week 3	Lazky's Law
Week 4,5&6	Nature of the Ore-bearing hydrothermal fluid and the form in which metals are transported in these fluids
Week 7&8	Methods of determination the temperature & pressure. One of these methods is using certain sulfide minerals Geothermometry and Geobarometry
Week 9&10	Methods of determination the temperature & pressure / Stable isotopes (sulfur isotopes)
Week 11&12	Methods of determination the temperature & pressure / Stable isotopes (Isotopes of oxygen and hydrogen)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Jensen, M.L. and Bateman, A.M., 1981, Economic mineral deposits. The Open University, 1974, Mineral deposits.	Yes Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	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	**Petroleum geology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-47033**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGIV		**Semester of Delivery**	Seven	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Radhwan Khaleel Hayder		**e-mail**	dr.radhwanatroshe@uomosul.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Omar Khalooq Mohammed Sajed		**e-mail**	o.k.mohammed-sajed@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives	1. Clarification of the petroleum system, including its elements, processes, and conditions. 2. This course can significantly contribute to the petroleum geology field from the point of view of source, reservoir, and cap rocks. 3. The course includes the principles of petroleum geology, including basic terms, petroleum composition, reservoir properties and conditions, oil and natural gas migration, and petroleum traps. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand the impact of this course on reservoir characterisation and identify their fluid. 6. This course clarifies the different types of migrations and traps that control generally the hydrocarbon accumulations.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Define petroleum geology and its relation to other sciences. 2. Definitions of main terms and historical achievements. 3. Description of the origin of petroleum. 4. Explanation of the organic carbon in sediments. 5. Clarification of the stages of organic matter maturation. 6. Interpretation of the basic composition of petroleum and physical properties of oils. 7. Explanation of porosity and controls on porosity. 8. Clarification permeability and reservoir rocks. 9. Identify migration of petroleum; primary and secondary migrations. 10. Interpretation of the migration mechanism 11. Explanation of the oil accumulation and nomenclature of traps. 12. Estimate of reserves and resources.
Indicative Contents	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction, the relation of petroleum geology to sciences in general, the petroleum system, basic vocabulary, historical development, the origin of petroleum, inorganic origin theory, metal carbide theory, cosmic origin theory, the organic origin theory, organic carbon in sediments, inversion of organic matter to petroleum, stages of organic matter maturation, diagenesis, catagenesis, metagenesis, types of kerogen. [*10* hrs] Source rocks, the basic composition of petroleum, the hydrocarbon constituents of petroleum, the nonhydrocarbon constituents of petroleum, physical properties of oils, specific gravities of oils, viscosities of oils, colours and relative indices of oils. [*8* hrs] Porosity, controls on porosity, sorting, grain packing, compaction, cementation, dissolution, dolomitisation, permeability, controls on permeability, reservoir rocks, migration of petroleum, primary migration, secondary migration, dismigration,

	vertical and horizontal migration, migration mechanism, seal rocks. [*10* hrs] Traps, classification of traps, structural traps, stratigraphic traps, hydrodynamic traps, combination traps, oil accumulation and nomenclature, basic statistics, estimate of reserves and resources of traps. [8 hrs] Revision problem classes. [3 hrs] <u>Part B – Practical labs</u> Introduction to well logging, core and log, borehole environment, resistivity logs, caliper logs, spontaneous potential logs (Sp), gamma ray logs. [18 hrs] Density logs, neutron logs, sonic logs, lithology estimation from wireline logs, porosity estimation from wireline logs. [18 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course includes the principles, methods and terms used in the petroleum geology field which expands students' perceptions about this science and its contents it includes that help in understanding the petrophysical properties of hydrocarbon reservoirs. In addition to using different techniques including mapping, equations to distinguishing the trap types and identifying porosity, permeability and fluid saturation. This will be achieved through lectures, labs, and interactive tutorials and by types of practical diagnostic methods for mapping, logging and oilfield visits which are very important for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
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	5
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 #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Introduction to petroleum geology
Week 2	The Petroleum System; elements, processes and conditions
Week 3	Basic vocabulary
Week 4	Historical development
Week 5	The origin of petroleum; Inorganic and origin theory
Week 6	Organic carbon in sediments
Week 7	Stages of organic matter maturation
Week 8	The basic composition of petroleum and physical properties of oils
Week 9	Porosity and controls on porosity
Week 10	Permeability and reservoir rocks
Week 11	Migration of petroleum; primary and secondary migrations
Week 12	Migration mechanism
Week 13	Petroleum traps and their classifications
Week 14	Oil accumulation and nomenclature of traps
Week 15	Estimate of reserves and resources

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to petroleum geology.
Week 2	Lab 2: The Petroleum System; elements, processes and conditions.
Week 3	Lab 3: Subsurface maps.
Week 4	Lab 4: Structural maps (Fold traps).
Week 5	Lab 5: Structural maps (Fault traps).
Week 6	Lab 6: Isopach Maps
Week 7	Lab 7: Facies Maps.
Week 8	Lab 8: Porosity.
Week 9	Lab9: Permeability.
Week10	Lab 10: The basic composition of petroleum and physical properties of oils
Week 11	Lab 11: Petroleum traps.
Week 12	Lab 12: Porosity and permeability relationship.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Gluyas J. & Swarbrick R. (2004)** Petroleum Geoscience. Blackwell Publishing, 359 p. **North, F.K. (1985)** Petroleum Geology. Allen & Unwin, 607 p.	No Yes
Recommended Texts	**Selley R.C. (1997)** Elements of Petroleum Geology, 2nd edition. Academic Press, 490 p. Darling, T., 2005. **Hunt, J.M. (1995)** Petroleum Geochemistry and Geology, 2nd edition. W.H. Freeman & Co, 743 p.	No No
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Engineering Geology			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**GEO-47032**				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		4	**Semester of Delivery**		7
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Dheyaa Ghawi Salih		**e-mail**	Dhiaaalsultani@uomosul.edu.iq	
Module Leader's Acad. Title		Teacher	**Module Leader's Qualification**		M.Sc.
Module Tutor	Mohammed Sheet Taka		**e-mail**	Dr. mohammedsheettaka@ uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		04/05/2024	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Structure Geology	**Semester**	5
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. Clarification of how engineering geology can make significant contributions to a Applied in geosciences. 2. Identify engineering properties of rocks which are useful in building-. 3. This course deals with the basic concept of the most important mechanical properties of rocks and soil aspects of this modular. 4. Learn about the most important scientific terms (engineering geology) and their definitions related to this topic. 5. To understand the impact of these Rocks behavior in Dams, Tunnels, and Constrictions-. 6. To perform different engineering applications.
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. List with description, the Rocks Mechanics, Soil Mechanics. 2. Define the various terms Compressive Strength, slake durability with Mathematical Equations to fined these Terms. 3. Definition of Engineering geology and Civil Engineering then show the importance in geoscience. 4. Summarize what is meant by the physical and mechanical properties of Rocks and Soil. 5. Discuss the types of Dams and involvement of Providing electricity and water for agriculture purposes 6.Define Tunnels, their types, and their importance in reducing traffic 7. Identify the site investigations and the applications to find the sutabile position for any construction. 8. Explain the Velocities tests and how the lithology effect on it. 9- Design and evaluation of surface mines and their importance in increasing the natural resources of raw materials.
Indicative Contents المحتويات الإرشادية	- Introduction to Engineering Geology. -Physical Properties of Rocks 1 (Density, Porosity &Permeability). - Physical properties of Rocks 2 (Ultrasound velocities, slake durability). - Mechanical properties of Rocks (Uniaxial compressive strength, Tensile strength, Triaxial com. Str.). -Outcrop description (orientation, roughness &wall strength). - Site investigations (seepage water (seepage water, block size &persistence). - Rock engineering (major rock mass classification). - Rock quality designation (RQD) index. - Dam geology (needs for dam construction, Dam types. - Subsurface opening (Natural opening, Artificial opening). - Mohr's circles for spatial (3-D) stress analysis. Tunnel geology. (28 hr.).

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Practicality approach:
- In situ density-
-Atterberg limits and indices (liquid limit, plastic limit & shrinkage limit).
-Grain size distribution of soil (sieve analysis method, hydrometer method and important of Grab. Siz.Dist.).
-Soil consolidation
- Uniaxial compressive strength test.
- Stress – strain curves in rocks.
-Tensile strength test of rocks.
- Estimation of unconfined shear strength of rocks.
-Triaxial compressive strength test of rocks.
-Dynamic elastic properties of rocks.
-Factors effecting on Dams. Geology and Foundations. - Underground cavities – limestone cavities. (28 hr.).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The strategy of engineering geology is to enable the student to identify the engineering characteristics of various types of rocks as well as soil, in addition to making engineering maps that help in building and engineering structure on the ground, as well as enabling the engineering geologist to give a final report on the suitability of the rocks under construction to bear large loads depended on mechanical properties of Rocks and Soil.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
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**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري	
	Material Covered
Week 1	Introduction to Engineering Geology
Week 2	Physical Properties of Rocks 1 (Density, Porosity &Permeability).
Week 3	Physical properties of Rocks 2 (Ultrasound velocities, slake durability).
Week 4	Mechanical properties of Rocks (Uniaxial compressive strength, Tensile strength, Triaxial com. Str.).
Week 5	Outcrop description (orientation, roughness &wall strength).
Week 6	Site investigations (seepage water (seepage water, block size persistence).
Week 7	Rock engineering (major rock mass classification).
Week 8	Rock quality designation (RQD) index.
Week 9	Dam geology (needs for dam construction, Dam types.
Week 10	Subsurface opening (Natural opening, Artificial opening).
Week 11	Mohr's circles for spatial (3-D) stress analysis.

Week 12	Tunnel geology.
Week 13	Mine Geology.
Week 14	Site investigation.
Week 15	Relationships between Engineer and Engineering Geologist.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Index physical properties of soil (weight – volume relationships
Week 2	In situ density.
Week 3	Atterberg limits and indices (liquid limit, plastic limit & shrinkage limit).
Week 4	Grain size distribution of soil (sieve analysis method, hydrometer method and important of Grab. Siz.Dist.).
Week 5	Soil consolidation
Week 6	Uniaxial compressive strength test.
Week 7	Stress – strain curves in rocks.
Week 8	Tensile strength test of rocks.
Week 9	Estimation of unconfined shear strength of rocks.
Week10	Triaxial compressive strength test of rocks.
Week 11	Dynamic elastic properties of rocks.
Week 12	Factors effecting on Dams. Geology and Foundations. Underground cavities – limestone cavities. (28 hr.).

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Engineering geology by Christopher Mathewson 1981 2- Goodman R.E. (1980). Introduction to Rock Mechanics. Jon Wiley & Sons USA.	Yes Yes

Recommended Texts	3- Franklin J. A. and Dassault M.B. (1989). Rock engineering. 4- Obert&L. Duval WI. (1967). Rock Mechanics and design of structures in rock.	Yes yes
Websites	https://Introduction to Engineering 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

Module Information معلومات المادة الدراسية					
Module Title	**Geology of Industrial Rocks**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	GEO-48040				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIV**	**Semester of Delivery**		**Eight**
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Oday Mohammed Salih Othman		**e-mail**	odayothman@uomosul.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		M.A.
Module Tutor			**e-mail**		
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Ore Geology	**Semester**	**Seven**
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. Classification of minerals and industrial rocks in terms of their presence and uses in order to evaluate them economically 2. Identify the main methods used in the extraction of minerals and industrial rocks 3. The student will know many types of Industrial minerals and Rocks especially nonmetallic , their characteristics, shapes, and its availability. 4. Learn about some of the important industries in which industrial minerals and rocks are used as raw materials, such as the manufacture of cement, plaster, etc
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. List with description, the Industrial minerals and Rocks. 2. Identify Characteristic properties of industrial minerals and rocks 3. Explain the classification of industrial minerals and rocks in terms of their industrial applications . 4. Explain the classification of Aggregates in terms of source and what are its uses and types 5. Discuss the Geological, physiomechanical & texture properties for building stone. 6. Identify the Identify the Building stones in Iraq. 7. Identify the Ceramic materials 8. Explain the properties and uses of clay minerals
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures Introduction, Classification of economic minerals about using as raw materials for the different industries, Mining operations , Mineral Processing Technology, Classification of industrial minerals & rocks , [*13* hrs] Building and Construction materials , Aggregates, Uses of sand and gravel, Physical and mechanical properties of aggregate , Classification of Lightweight Aggregates, Building stones, Types of building stones . [*10*hrs] Features of building stone, Building stones in Iraq, Plaster (juss) industry , Metallurgical and refractory materials , Cement Industry , Manufacture stages of Portland cement, Kinds of cement, Structural clay products, Ceramic materials . [*13* hrs] Revision problem classes [3 hrs] Part B – Practical labs Mining Excavation Methods . open-pit and underground mine, Evaluation of Ore

	Bodies (Sand and Gravel Deposit) , Processing and Beneficiation Methods. Improvement of Properties of Some Industrial Rocks Using Magnetic Separation Method, . [18 hrs] Methods of Measuring Some Physical Properties of Different Types of Rocks (Effects of Rocks Properties on Their Suitability for Using as Building Stones), Movement of Water in Rocks Capillarity: Height of water rise as a function of time , Portland Cement , Calcination of Limestone (The effect of burning temperature and time on properties of lime produced) [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expanding students' perceptions of this science and its contents that help in classifying industrial minerals and rocks found in nature and the possibility of using them as primary raw materials in many important industries, and knowing the workflow of these industries through conducting scientific trips to some factories such as cement factories and Al-Mishraq sulfur field, in addition to solving Some mathematical problem related to the methods of extracting these minerals and rocks and calculating some important physical characteristics to determine the possibility of using them as primary raw materials in many important industries

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
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	5
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 #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Classification of economic minerals about using as raw materials for the different industries
Week 2	Mining operations
Week 3	Mineral Processing Technology (Treatment and Beneficiation)
Week 4	Classification of industrial minerals & rocks
Week 5	Building and Construction materials
Week 6	Geological forms (occurrence) of sand & gravel deposits
Week 7	Lightweight aggregates
Week 8	Types of building stones
Week 9	Building stones in Iraq
Week 10	Metallurgical and refractory materials
Week 11	Geology and the Cement Industry
Week 12	Structural clay products
Week 13	Brick making industry
Week 14	Kaolin or china clays
Week 15	**Industrial and Manufacturing Materials:**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1&2	Mining Excavation Methods . open-pit and underground mine
Week 3&4	Evaluation of Ore Bodies (Sand and Gravel Deposit)
Week 5	Processing and Beneficiation Methods. Improvement of Properties of Some Industrial Rocks Using Magnetic Separation Method
Week 6&7	Methods of Measuring Some Physical Properties of Different Types of Rocks (Effects of Rocks Properties on Their Suitability for Using as Building Stones)
Week 8	Movement of Water in Rocks Capillarity: Height of water rise as a function of time
Week 9&10	Portland Cement .
Week 11&12	Calcination of Limestone (The effect of burning temperature and time on properties of lime produced)

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Bates, R.L., 1969, Geology of the industrial rocks and minerals. Jensen, M.L. and Bateman, A.M., 1981, Economic mineral deposits. The Open University, 1974, Constructional and other bulk materials.	Yes Yes Yes
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	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	**Exploration geochemistry &isotope geology**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-48039**				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	UGIV		**Semester of Delivery**	Eight	
Administering Department	Geology Science		**College**	Science	
Module Leader	Flyah Hassan Abbas		**e-mail**	flyahabas@uomosul.edu.iq	
Module Leader's Acad. Title	lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Ann Abdulsattar Ismail		**e-mail**	annabdulsattar@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	none	**Semester**	
Co-requisites module	Geochemistry	**Semester**	5

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

Module Objectives أهداف المادة الدراسية *يتم كتابة اهم الأهداف التي تغطيها هذه المادة الدراسية بشكل جمل او فقرات توضح المواضيع التي سيتم التطرق اليها و دراستها و معالجتها)*	1. Clarification of how studying this course can make significant contributions to the applied geochemistry field. 2. Identify important of elements and isotopes concentrations which are useful in Exploration geochemistry &isotope geology. 3. This course deals with the principles of geochemical exploration and isotopes geology , and how to use the results of geochemical analysis to infer the locations of the ore body, as well as the uses of geochemical analyzes of isotopes in determining the ages of different geological events. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand the impact of this course on methods of geochemical exploration and isotopes . 6. This course employs how to deal with analytical data and use it to infer the places where economic materials are collected, as well as identify ways to determine the ages of geological events using the results of isotope analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية *يتم كتابة اهم المُخرجات او الناتج و الكَم العلمي الذي يتم استخدامه للتدريس في هذه المادة على شكل أسئلة أساسية تخص منهاج المادة بأكمله و يجب ان لا تقل هذه المُخرجات من ناحية العدد عن 6 مُخرجات و يفضل ان تكون بعدد أسابيع الدراسة.*	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Define geochemical exploration and describe its tool types. 2. Definitions of main terms and methods of geochemical exploration and Mineral Prospecting works . 3. Description of the geochemical environments and mobility . 4. Explanation of geochemical dispersion patterns . 5. Discuss the geochemical coherence , indicator elements and pathfinder elements . 6. Interpretation the Primary and secondary dispersion patterns . 7. Define isotopes geology and describe its tool types. 8. Explain the decay mechanism of radioactive isotopes and the general age equation 9. Explanation of the K-Ar method of dating . 10. Discuss the Argon–argon ($^{40}Ar/^{39}Ar$) method of dating . 11. Explanation of the Rb-Sr method to determine dating. 12. Description the U-Th-Pb method of dating and stable isotopes.
Indicative Contents المحتويات الإرشادية *يتم كتابة اهم العناوين الرئيسية للمواضيع بشكل متسلسل و التي تشمل كافة الفقرات التي تحتويها مع إدراج عدد الساعات المطلوبة لتنفيذ كل فقرة.*	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction to geochemical exploration , What is geochemical exploration , Methods of Geochemical Exploration and Mineral Prospecting works, the geochemical Environments , Primary environment , Secondary environment , geochemical dispersion and mobility , mobility of elements in primary environment , mobility of elements in secondary environment, geochemical coherence , Indicator elements , pathfinder elements. [10 hrs] Primary dispersion patterns , Syngenetic patterns, Geochemical province, local syngenetic pattern, Epigenetic patterns, hydrothermal dispersion patterns , dispersion patterns by the influence of temperature and pressure on the late

	minerals, Secondary dispersion patterns, mechanical dispersion patterns, hydromorphic dispersion patterns , biochemical dispersion patterns .[8 hrs] Introduction to isotopes , decay mechanism of radioactive isotopes , the general age equation, Mass Spectrometer , The K-Ar method of dating, Argon–argon ($^{40}Ar/^{39}Ar$) method of dating. [10 hrs] Rb-Sr Method of Dating, The Uranium , Thorium–Lead methods of dating , The Carbon-14 method of dating, Stable isotopes, Oxygen and Hydrogen isotopes , Sulfur Isotopes. [8 hrs] Revision problem classes [3 hrs] Part B – Practical labs The movement of elements between rock and solution, The loss and gain of elements in the rock, The evalution of weathering from gain and loss, Geochemical mapping by the moving average method, Statistical treatment (distribution type of elements) (2 parts), The effect of topography on the exploration of ore location. [18 hrs] K-Ar method of dating, Argon–argon (40Ar/39Ar) method of dating, the Rb-Sr method to determine dating, the effect of heating on the metamorphism, Rb-Sr isochron method and dating ages of igneous rocks. [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies *يتم كتابة ملخص الاستراتيجية الرئيسية التي سيتم تبنيها في تقديم هذه المادة*	The course includes the principles, methods and techniques used in geochemical exploration and isotopes geologe field which expanding students' perceptions about this science and its contents it includes that help in evaluation how to use the results of geochemical analysis to infer the locations of the ore body, as well as the uses of geochemical analyzes of isotopes in determining the ages of different geological events.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
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	5
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 #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Introduction to geochemical exploration, Methods of Geochemical Exploration and Mineral Prospecting works .
Week 2	The Geochemical Environments, Geochemical dispersion and mobility , Mobility of elements in primary environment , Mobility of elements in secondary environment .
Week 3	Geochemical Coherence , Indicator Elements , Pathfinder Elements .
Week 4	Primary dispersion patterns , Syngenetic patterns : Geochemical province , Local syngenetic pattern.
Week 5	Epigenetic patterns : Hydrothermal dispersion patterns.
Week 6	Dispersion patterns by the influence of temperature and pressure on the late minerals .
Week 7	Secondary dispersion patterns : Mechanical dispersion patterns , Hydromorphic dispersion patterns, Biochemical dispersion patterns .
Week 8	Introduction to isotopes , Decay mechanism of radioactive isotopes .
Week 9	The general age equation
Week 10	Mass Spectrometer, The K-Ar method of dating
Week 11	Argon–argon (40Ar/39Ar) method of dating.
Week 12	Rb-Sr Method of Dating.
Week 13	Rb-Sr isochron method and dating ages of igneous rocks.
Week 14	The Uranium , Thorium–Lead methods of dating , The Carbon-14 method of dating.
Week 15	Stable isotopes : Oxygen and Hydrogen isotopes , Sulfur Isotopes.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: The movement of elements between rock and solution.
Week 2	Lab 2: The loss and gain of elements in the rock.
Week 3	Lab 3: The evaluation of weathering from gain and loss.
Week 4	Lab 4: Geochemical mapping by the moving average method.
Week 5	Lab 5: Statistical treatment (distribution type of elements) (part 1).
Week 6	Lab 6: Statistical treatment (distribution type of elements) (part 2).
Week 7	Lab 7: The effect of topography on the exploration of ore location.
Week 8	Lab 8:. K-Ar method of dating.
Week 9	Lab9: Argon–argon (40Ar/39Ar) method of dating.
Week10	Lab 10: the Rb-Sr method to determine dating.
Week 11	Lab 11: the effect of heating on the metamorphism.
Week 12	Lab 12: Rb-Sr isochron method and dating ages of igneous rocks.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Rose , A.W. and Gundlach ,H. (1980) :** Geochemical Exploration , Academic Press, Elsevier . 667p . **Allègre, C. J. (2008) :** Isotope geology , Cambridge University Press. 534p .	No No
Recommended Texts	**Ashoke, K. T. (2020) :** Geochemical Exploration and Modelling of Concealed Mineral Deposits , Springer International . 2010p. **Rasskazov ,S. V., Brandt, S. B. and Brandt, I. S. (2010) :** Radiogenic Isotopes in Geologic Processes , Springer Netherlands . 312p .	No No
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Seismic & electrical methods**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-48041**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Bashar Aziz Mahmoud		**e-mail**	basharaziz@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Zainab musadaq shanshal		**e-mail**	zainabmosadq@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	23/4/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Geophysics Gravity & Magnetic method	**Semester**	5
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. Understand seismic and geoelectrical data acquisition and processing. 2. Visualize seismic and geoelectrical data and develop interpretation capacity. 3. Interpret and map faults and seismic horizons. 4. Identify hydrocarbon accumulations using seismic data. 5. Identify water table using geoelectrical data. 6. Quantify and risk hydrocarbon accumulations.
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- Acquisition of seismic and geoelectrical data. 2- Process and analyze collected seismic and geoelectrical data. 3- Employ appropriate modeling methodologies, and evaluate strengths, weaknesses, and limitations. 4- Infer seismic and electrical properties at depth and formulate geological interpretations from those properties. 5- Demonstrate effective team-work and communication skills. 6- Analyze the earthquakes parameters
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures Introduction of seismic methods, Stress and strain , Elastic moduli, Seismic waves , Some basic principles for seismic waves, Ray paths in layered media (waves partitioning), Seismic refraction explorations, Seismic refraction explorations(Principles, Data acquisition, processing and interpretation) , limitations of seismic refraction exploration,. [*10* hrs] Seismic reflection explorations (Principles, Data acquisition, processing and interpretation). [*8* hrs] Introduction of geoelectrical methods, Geoelectrical properties of minerals and rocks (resistivity and conductivity), Resistivity method, [*10* hrs] Self potential method, EM method, IP method. Advances and limitation of geoelectrical methods. [8 hrs] Revision problem classes [3 hrs] Part B – Practical labs Elastic moduli determination, Seismic refraction problems (two layer case, three layer case, multi-layer case, incline reflector case). [18 hrs] Seismic reflection problems (horizontal reflector, incline reflector, static correction, dynamic correction, correlation, convolution, interpretation model. [18 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expand students' perceptions of these two geophysical methods and their contents that help in analyzing seismic and geoelectrical data. In addition to the use of various geophysical tools in the field geophysical survey to reveal what is under the surface of the earth, such as structures, hydrocarbon reservoirs, groundwater tables, buried mineral deposits...etc.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	80	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	**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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري	
	Material Covered
Week 1	Introduction - stress and strain – elastic moduli
Week 2	Seismic waves - some basic principles for seismic waves
Week 3	Ray paths in layered media (waves partitioning)
Week 4	Seismic refraction explorations (Data acquisition, processing)
Week 5	Interpretation of seismic refraction data – Advantages & limitation of seismic refraction interpretation
Week 6	Seismic reflection explorations (principles - Data acquisition)
Week 7	Processing & interpretation of seismic reflection data
Week 8	Seismology (introduction - causes of earthquakes – main parameters of earthquake – types of earthquake's scales)
Week 9	Geoelectrical methods (introduction – Electrical properties (Resistance, Conductance, Resistivity, & Conductivity)
Week 10	Electrical conductivity in mineral and rocks
Week 11	Parameters effecting in rocks conductivity, Archie's law
Week 12	Resistivity method (principles- types of electrodes spreading- geometric factors – interpretation)
Week 13	Self-potential method. (principles- data acquisition- interpretation)
Week 14	Electromagnetic methods (principles- data acquisition- interpretation)
Week 15	Induced polarization (principles- data acquisition- interpretation)

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Determination of elastic moduli.
Week 2	Lab 2: Snell`s law in various layer velocities.
Week 3	Lab 3: Reflection & Transmission coefficient (R &T).
Week 4	Lab 4: Seismic refraction data interpretation (two & Three layer case).
Week 5	Lab 5: Seismic refraction data interpretation (incline refractors).
Week 6	Lab 6: Seismic reflection (determination of horizontal reflector velocity and depth).
Week 7	Lab 7: Static correction.

Week 8	Lab 8:.Dynamic correction.
Week 9	Lab9: Earthquake's parameters determination.
Week10	Lab 10: Representation and interpretation of resistivity data two &three layer case) .
Week 11	Lab 11: Resistivity imaging (2D& 3D interpretation).
Week 12	Lab 12: Representation and interpretation of Em & IP data.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Telford, W.M., Geldart, L.P. and Sheriff, R.E. (1990),** Applied Geophysics. 2nd Edition, Cambridge University Press, Cambridge, 770p. **John M. Reynolds (2011**). An Introduction to Applied and Environmental Geophysics, Wiley-Blackwell , 696p.	Yes Yes
Recommended Texts	**Prem V. Sharma, (1997)**. Environmental and Engineering Geophysics 1st Edition, Cambridge University Press, 500 p. **G.V. Keller, Michael S. Zhdanov, (1994)**. The Geoelectrical Methods in Geophysical Exploration (Methods in Geochemistry and Geophysics), Elsevier Science, 884p.	Yes No
Websites	https://www.ug.edu.gh/physics/courses/phys362-principles-applied-geophysics https://www.geotomosoft.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

Module Information معلومات المادة الدراسية					
Module Title	**Well logging**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-48138**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		UGIV	**Semester of Delivery**		Eight
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Omar Khalooq Mohammed Sajed		**e-mail**	o.k.mohammed-sajed@uomosul.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Radhwan Khaleel Hayder		**e-mail**	dr.radhwanatroshe@uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives	1. Clarifying how studying this course can significantly contribute to the petroleum geology field. 2. Identify porosity and permeability, which help identify reservoir quality. 3. This course deals with the basic concept of well logging and the reservoir properties generally depending on the rock properties, including the rock's electrical and radioactivity properties. 4. Learn about the most critical scientific terms (Terminology) and their definitions related to this topic. 5. To understand the impact of this course on reservoir characterisation and identify their fluid. 6. This course employs the well logging study to identify main reservoir properties, including lithology, shale volume, porosity and fluid saturation.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Define well logging and describe logging tool types. 2. Definitions of main terms and historical achievements. 3. Description of borehole environment. 4. Explanation of hydrocarbon saturation and how to calculate. 5. Clarification of the general operating principle of the resistivity logs; normal device, induction, laterolog, microresistivity and their applications. 6. Interpretation the general operating principle of the caliper logs, spontaneous potential logs (Sp) including their principles and applications. 7. Explanation of the general operating principle of the gamma-ray logs including the application of the gamma-ray log to shale content evaluation. 8. Clarification of the density logs including their principles and applications. 9. Identify porosity derived from density logs. 10. Interpretation of the neutron logs; neutron response of minerals, porosity and fluids. 11. Explanation of the sonic log; transit time of shales and sonic response of minerals and porosity. 12. Identification lithology and porosity from wireline logs.
Indicative Contents	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction, the presentation of log data, borehole types, mud logging, mud additives, functions of drilling mud, types of drilling fluids, basic well logging equipment, wireline log tools, log tool types, electrical logs, mechanical logs, radioactive logs, acoustic Logs, well logging history, advantages and limitations of well logging. [*10* hrs] Basic theory on resistivity, Important terminology, definitions, and equations, Porosity, effective porosity, permeability, water saturation, the borehole environment, drilling mud, invasion, mud cake, mud filtrate, invaded zone, uninvaded zone, flushed zone, transition zone. [*8* hrs]

	Hydrocarbon saturation, Bulk volume of movable and residual hydrocarbon, resistivity logs, advantages of resistivity logs, resistivity log types, old resistivity logs, modern resistivity logs, induction log, spontaneous potential (self-potential) [*10* hrs] Caliper log, Gamma-ray log, total gamma-ray, spectral gamma ray, density log (RHOB), density porosity, neutron log, neutron log applications, sonic log, sonic log applications, lithology identification using well log analysis, porosity identification using well log analysis. [8 hrs] Revision problem classes. [3 hrs] Part B – Practical labs Introduction to well logging, core and log, borehole environment, resistivity logs, caliper logs, spontaneous potential logs (Sp), gamma ray logs. [18 hrs] Density logs, neutron logs, sonic logs, lithology estimation from wireline logs, porosity estimation from wireline logs. [18 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The course includes the principles, methods and techniques used in drilling and well logging field which expanding students' perceptions about this science and its contents it includes that help in formation evaluation and petrophysical properties of hydrocvarbon reservoir. In addition to using different techniques including crossplots, equations, and integrated set of well logs in distinguishing the lithology, porosity, and fluid saturation. This will be achieved through lectures, labs, and interactive tutorials and by types of practical diagnostic methods for logging and oilfield visits which are very important for the students.

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

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Introduction to well logging
Week 2	Main terms, definitions, and historical achievements
Week 3	Borehole environment
Week 4	Hydrocarbon saturation
Week 5	The resistivity logs; normal device, induction, laterolog, microresistivity.
Week 6	The caliper logs, spontaneous potential logs (Sp); principles and application
Week 7	The gamma ray logs; application of the gamma ray log to shale content evaluation.
Week 8	The density logs; principles and application
Week 9	Porosity derived from density logs
Week 10	The neutron logs; neutron response of minerals and fluids.
Week 11	Porosity derived from neutron logs
Week 12	Sonic log; transit time of shales
Week 13	Porosity derived from sonic logs
Week 14	Lithology estimations from wireline logs
Week 15	Porosity estimations from wireline logs

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction to well logging.
Week 2	Lab 2: Core and log description.
Week 3	Lab 3: Borehole environment.
Week 4	Lab 4: The resistivity logs (Exercise-1).
Week 5	Lab 5: The resistivity logs (Exercise-2).
Week 6	Lab 6: The caliper logs, spontaneous potential logs (Sp).
Week 7	Lab 7: The gamma ray logs.
Week 8	Lab 8: The density logs.
Week 9	Lab9: The neutron logs.
Week10	Lab 10: Sonic logs.
Week 11	Lab 11: Lithology estimation from wireline logs.
Week 12	Lab 12: Porosity estimations from wireline logs.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Asquith, G., and Krygowski, D., 2004.** Basic well log analysis. American Association of Petroleum Geologists, Tulsa, Oklahoma, 244 p. **Asquith, G. and Gibson, C.R., 1982.** Basic well log analysis for geologists, American association of petroleum geologists, Tulsa, Oklahoma, 216p.	No Yes
Recommended Texts	**Catuneanu, O., 2006.** Principles Sequence Stratigraphy, First edition. Elsevier, Amsterdam, 375p. **Darling, T., 2005.** Well logging and formation evaluation. Gulf professional publishing, Elsevier, 326p. **Rider, M.H., 2002.** The geological interpretation of well logs, 2nd edition, Rider-French Consulting Ltd, 280p.	No No No
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Hydrogeology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**GEO-48037**				
ECTS Credits	**5**				
SWL (hr/sem)	125				
Module Level	4		**Semester of Delivery**	8	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Mohammed sheet Mohammed Ramzi Taka		**e-mail**	dr.mohammedsheettaka@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dheyaa Ghawi Salih		**e-mail**	Dhiaaalsultani@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	5/05/2024		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Clarification of how Hydrogeology can make significant contributions to a useful in geosciences. 2. Identify groundwater and surfacewater which are useful in Hydrogeology. 3. This course deals with the basic concept of the most important factors that specify metals aspects of this modulare. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand the impact of these physical & chemical factors in water structure. 6. To perform different types of water structure applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The student will study and classify surfacewater and groundwater structure of minerals in terms of the external shape and internal structure of the water and the identification of minerals as well as knowledge of the hydrogeology structure and the aquifers and the study of its parts, which in turn determines the water system
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures an introduction hydrogeological cycle [12 hrs] Groundwater [16 hrs] Pumping test [12 hrs] Groundwater modeling[12 hrs] hydrogeochemistry [12 hrs] Part B – Practical labs Introduction hydrogeological cycle [12 hrs] Groundwater [12 hrs] Pumping test [6 hrs] hydrogeochemistry [10 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	It is a science specialized in the study and classification of hydrogeology in terms of the surfacewater and groundwater and the identification of the type of aquifers it contains as well as knowledge of the porosity and Darcys law.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
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 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري	
	Material Covered
Week 1	an introduction Definition of hydrogeology and watercycle
Week 2	Precipitation
Week 3	Surface runoff
Week 4	Evaporation and infiltration
Week 5	River flow
Week 6	Stream flow analysis
Week 7	Flow nets
Week 8	Ground water Hydrogeology

Week 9	Aquifers
Week 10	Porosity and Permeability
Week 11	Darcys Law
Week 12	Pumping test
Week 13	Water pollution
Week 14	Ground water modeling
Week 15	Hydrogeochemistry

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction
Week 2	Rainfall analysis.
Week 3	Morphometric analysis.
Week 4	Filtration capacity measurment
Week 5	Evaporation measurment
Week 6	River flow analysis
Week 7	**Hydrograph**
Week 8	Drawing groundwater levels
Week 9	Flow net
Week10	Pumping test measuring
Week 11	Classification of ground water modeling
Week 12	Hydrogeochemistry
Week 13	Drilling engineer

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Yes
Recommended Texts		Yes
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**General Geology I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-1101**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rafee Ibrahim Al-Humidi		**e-mail**	Rafeegeo66@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Falah Abed Al-Miamary		**e-mail**	falahabed@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	22/04/2024		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The study aims to introduce students in the first stage to the science of geology and all its branches and specializations. This is done by giving preliminary introductory lectures in a simplified and in-depth manner to all the disciplines that the student will learn in the coming stages, so that he will be prepared later to delve deeper into those disciplines when he learns them in the future.Where students will be taught about the types of rocks and minerals and the methods of their formation, and then the natural physical, chemical and biological processes that affect them and that work to break them down. تهدف الدراسة الى تعريف الطلاب بالمرحلة الأولى بعلم الجيولوجيا وكافة فروعه وتخصصاته، ويتم ذلك عن إعطاء محاضرات أولية تعريفية بصورة مبسطة وغير معمقة لكل التخصصات التي سيتعلمها الطالب بالمراحل القادمة ليكون مهيأ فيما بعد للتعمق بتلك التخصصات حين يتعلمها مستقبلا. ثم سيتم تعليم الطلاب على أنواع الصخور والمعادن وطرق تكونها، ومن ثم العمليات الطبيعية الفيزيائية والكيميائية والبايولوجية المؤثرة عليها والتي تعمل على تفتيتها
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Studying the earth and the creation of the universe, and the divisions of the earth and its parts. Identifying the main elements of the earth's crust, studying minerals and their types, and methods of diagnosing them. And then the study of igneous rocks and the method of their origin and divisions. Sedimentary rocks, their types, characteristics, methods of formation, and areas of formation (depositional environments). As well as metamorphic rocks, methods of transformation, conditions of transformation and their divisions. Identify the factors affecting the weathering of rocks and methods of transporting sediments, their aggregation and cohesion. دراسة الأرض ونشأة الكون، وأقسام الأرض وأجزائها. التعرف على العناصر الرئيسية للقشرة الأرضية، دراسة المعادن وأنواعها، وطرق تشخيصها. ومن ثم دراسة الصخور النارية وطرقة نشأتها وتقسيماته. والصخور الرسوبية وأنواعها وميزاتها وطرق تكونها، ومناطق تكونها (بيئات ترسيبها). وكذلك الصخور المتحولة وطرق التحول وشروط التحول وتقسيماتها. التعرف على العوامل المؤثرة على تجوية الصخور وطرق نقل الرواسب، وتجمعها وتماسكها.
Indicative Contents المحتويات الإرشادية	Introduction to geology, What is geology?, What do geologists do?, Solar system , New hypothesis. Structure of the earth. Crust, Mantle, Core, The rock cycle, Group of rocks. Minerals, Introduction, Natural occurring, inorganic materials, Crystal structure, Chemical composition of minerals, Physical properties of minerals. Minerals groups, Silicate minerals t, Clay minerals, Nonsilicate minerals. Minerals identification, Color, Luster…etc, How minerals form, Cooling magma, Crystallize from hot water, Chemical weathering processes, Metamorphism, The rock forming minerals. Igneous rocks, Introduction, magma and lava, Composition of magma, How magma originates and changes Bowen's reaction series, Characteristics of igneous rocks, Igneous rocks textures, Chemical composition of igneous rocks. Classification of igneous rocks, Volcanism, Sills and dikes, Batholiths and stocks. Sedimentary rocks, Introduction, Formation of sedimentary rocks, Occurrence of

	sedimentary rocks, Sedimentary depositional environments. Sediments and sedimentary rocks, Types of sedimentary rocks, Detrital sedimentary rocks, Chemical and biochemical sedimentary rocks. Sedimentary facies, Strata or beds, Sedimentary structures, Fossils, Formation, Petroleum and natural gas. Metamorphic rocks, Introduction, The agents of metamorphism, Types of metamorphism. The classification of metamorphic rocks, Foliated & Nonfoliated metamorphic rocks. Weathering, erosion and soil formation, Introduction, Types of weathering, Mechanical weathering, Chemical weathering, Climate and chemical weathering, Particle size and rate of chemical weathering, Parent material. Soil, The soil profile, Factors controlling soil formation.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching students how to identify minerals and their properties, and thus how to identify the types of rocks by nature and distinguish them easily in the field, and stimulate them to understand the ways of their formation and predict the regions and methods of their formation. Methods of distinguishing natural factors affecting rocks تعليم الطلاب كيفية التعرف على المعادن وعائديتها ، وبالتالي كيفية التعرف على أنواع الصخور بالطبيعة وتميزها بسهولة حقلياً وأستثارتهم لفهم طرق تكونها وتوقع مناطق وطرق تكونها. وطرق تمييز العوامل الطبيعية المؤثرة على الصخور

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	7.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.0
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري

	Material Covered
Week 1	Introduction to geology, What is geology? What do geologists do?, Solar system , New hypothesis.
Week 2	Structure of the earth. Crust, Mantle, Core, The rock cycle, Group of rocks.
Week 3	Minerals, Introduction, Natural occurring, inorganic materials, Crystal structure, Chemical composition of minerals, Physical properties of minerals. . Minerals groups, Silicate minerals t, Clay minerals, Nonsilicate minerals. Minerals identification, Color, Luster…etc, How minerals form, Cooling magma, crystallize from hot water, Chemical weathering processes, Metamorphism, the rock forming minerals
Week 4	Igneous rocks, Introduction, magma and lava, Composition of magma, How magma originates and changes
Week 5	Sedimentary rocks, Introduction, Formation of sedimentary rocks, Occurrence of sedimentary rocks, Sedimentary depositional environments.
Week 6	Sediments and sedimentary rocks, Types of sedimentary rocks, Detrital sedimentary rocks, Chemical and biochemical sedimentary rocks.
Week 7	Sedimentary facies, Strata or beds, Sedimentary structures, Fossils, Formation, Petroleum and natural gas.
Week 8	Metamorphic rocks, Introduction, The agents of metamorphism, Types of metamorphism.
Week 9	The classification of metamorphic rocks, Foliated & Nonfoliated metamorphic rocks..
Week 10	Weathering, erosion and soil formation, Introduction, Types of weathering, Mechanical weathering, Chemical weathering,
Week 11	Climate and chemical weathering, Particle size and rate of chemical weathering, Parent material.
Week 12	Soil, The soil profile, Factors controlling soil formation.
Week 13	Bowen's reaction series, Characteristics of igneous rocks, Igneous rocks textures. Classification of igneous rocks, Volcanism, Sills and dikes, Batholiths and stocks.
Week 14	Summary.
Week 15	Field trip

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: over view of geology.
Week 2	Lab 2: How identification of mineral.
Week 3	Lab 3: Physical properties of minerals.
Week 4	Lab 4: Chemical properties of minerals.
Week 5	Lab 5: Types of rocks in the nature.
Week 6	Lab 6: Properties of Igneous rocks .
Week 7	Lab 7: classification of Igneous rocks.
Week 8	Lab 8 Properties of Metamorphic rocks.
Week 9	Lab9: classification of Metamorphic rocks.
Week10	Lab 10: Properties of Sedimentary rocks.
Week 11	Lab 11: classification of Sedimentary rocks.
Week 12	Lab 12: summery

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**AL-Dabbagh. T.H. (2017) The Earth_/… An Introduction to Physical geology First edition. 366P.**	Yes Yes
Recommended Texts	**Thompson Graham R, Turk Jonathen, 2011. Earth, what inside, Student Edition, Brookes/ Cole, cengage learing**	Yes No
Websites	https://www.youtube.com/watch?v=BgJ74KKZyD4&list=PLSGK9-_-8f-8PLeQMvg-KDnoHGy5hBwL1 https://www.youtube.com/watch?v=fgnvKVzZZes&list=PLcI_lGDDt5A65hZDfQVPMEUzDRYYXWHoy	

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	**Crystallography**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-1102**				
ECTS Credits	7				
SWL (hr/sem)	200				
Module Level		UGI	**Semester of Delivery**		One
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Omar Saif Aldeen Dawood Al-Taweel		**e-mail**	omarsaif@uomosul.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Mohammed A.Suliman Al-Jubory		**e-mail**	masuliman@uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mineralogy	**Semester**	2
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. Clarification of how Crystallography can make significant contributions to a useful in geosciences. 2. Identify element which are useful in mineralogy. 3. This course deals with the basic concept of the most important factors that specify metals aspects of this modulare. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand the impact of these physical & chemical factors in crystal structure. 6. To perform different of crystal structure applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية .	The student will study and classify the crystal structure of minerals in terms of the external shape and internal structure of the crystal and the identification of minerals as well as knowledge of the internal structure of the crystals and the study of its parts, which in turn determines the crystalline system
Indicative Contents المحتويات الإرشادية ***يتم كتابة اهم العناوين الرئيسية للمواضيع بشكل متسلسل و التي تشمل كافة الفقرات التي تحتويها مع إدراج عدد الساعات المطلوبة لتنفيذ كل فقرة.***	Indicative content includes the following. <u>Part A – Theoretical lectures</u> an introduction Definition of crystal and metal Amorphous and amorphous materials crystal systems properties of extrinsic crystals [12 hrs] crystal parts, crystal axes Symmetry elements Axial Ratios and Crystal Intersections Miller's coefficients Crystal shape and body [16 hrs] Drawing crystals and crystal projection crystal projection spherical projection Stratographic projection wolf network [12 hrs] Thirty-two crystal types Names and symbols used for crystal species [12 hrs] Distinctive symmetry of crystal systems crystal structure crystal zone Types of twins [12 hrs] <u>Part B – Practical labs</u> Introduction Crystal parts. Crystal Systems. Work on samples to determine the crystalline system Symmetry in Crystals [12 hrs]

	Description of Symmetry in Crystals Crystal Forms Description of Crystal Forms [12 hrs] Miller Indices Measurement the Miller Indices [6 hrs] Stereographic projection Symbols used in Stereographic projection Plotting of symmetry elements on the Stereographic projection [10 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	It is a science specialized in the study and classification of the crystal structure of minerals in terms of the external shape and internal structure of the crystal and the identification of minerals it contains as well as knowledge of the internal structure of crystals and the study of its parts, which in turn determines the crystal system of the mineral and the reflection of this system on the external general shape and the structural properties of the metal.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	110	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	90	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

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

					Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري	
	Material Covered
Week 1	an introduction Definition of crystal and metal Amorphous and amorphous materials
Week 2	crystal systems properties of extrinsic crystals
Week 3	crystal parts crystal axes Symmetry elements
Week 4	Axial Ratios and Crystal Intersections
Week 5	Miller's coefficients
Week 6	Crystal shape and body
Week 7	Drawing crystals and crystal projection
Week 8	crystal projection
Week 9	spherical projection
Week 10	Stratographic projection wolf network
Week 11	Thirty-two crystal types

Week 12	Names and symbols used for crystal species
Week 13	Distinctive symmetry of crystal systems crystal zone
Week 14	Types of twins
Week 15	crystal structure

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction
Week 2	Crystal parts.
Week 3	Crystal Systems.
Week 4	Work on samples to determine the crystalline system
Week 5	Symmetry in Crystals
Week 6	Description of Symmetry in Crystals
Week 7	**Crystal Forms**
Week 8	Description of Crystal Forms
Week 9	Miller Indices
Week10	Measurement the Miller Indices
Week 11	tereographic projection
Week 12	Symbols used in Stereographic projection
Week 13	Plotting of symmetry elements on the Stereographic projection

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	علم البلورات Crystallography An Introduction Walter Borchardt-Ott	Yes
Recommended Texts	Introduction to Crystallography Frank Hoffmann https://link.springer.com/book/10.1007/978-3-030-35110-6#author-0-0	Yes
Websites	https://youtu.be/tINc5VSK_iY?feature=shared https://ocw.mit.edu/courses/3-60-symmetry-structure-and-tensor-properties-of-materials-fall-2005/resources/introduction-to-crystallography-part-1/	

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	**Chemistry**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**COS-1103**				
ECTS Credits	8				
SWL (hr/sem)	**200**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rana Abdallmalik Alquaba		**e-mail**	ranaalqubua@uomosul.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	Kalid Natheer		**e-mail**		
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To understand the basic concepts of Periodic Table (P.T) 2. To study about chemical and physical properties and behavior of elements.. 3. In order to study transition metals to understand the trends in properties and reactivity of the d-block elements. 4. To explain the typical physical and chemical properties of the transition metals. To identify simple classes for transition metals and describe their chemical properties.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To understand the key elemnts of Periodic Table (P.T) 2. To be able to write electronic configuration of given atomic number. 3. To be able to use Crystal Field Theory to understand the magnetic properties (and in simple terms the colour) of coordination compounds. 4. To be able to describe the stability of metal complexes by the use of formation constants and to calculate thermodynamic parameters from them. 5. To be able to recognize the types of isomers in coordination compounds. 6. To be able to calculate bond order of different molecules.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Theoretical lectures</u> **1.** Transition elements, definition, physical properties, characteristic properties. [2hr] **2.** Group (1) and group 2,3,4,5,6 and d-block elements, f-block ele,coordination chemistry, important of complexes. [6hr] **3.** Chain theory ,Werner's theory ,type of ligands, classification of metal complexes. [4hr] **4.** Nomenclature of coordination compounds, Bonding theories for coordination compounds, and isomerism. [4hr] **5.** EAN rules, valence bond theory [4hr] **6.** Crystal field theory. [4hr] **7.** CFSE for octahedral ,tetrahedral, and square planer. [4hr] Exp.6 Acetylaceton Complexes (Part 1 and 2) [6hr]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Reviewing and recalling key terms, Effective Questioning Techniques, Using a visual image, using a model, using a periodic table.

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	7.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري	
	Material Covered
Week 1	Periodic Table (P.T)
Week 2	Blocks of periodic table (P.T)
Week 3	Complete of
Week 4	First Quiz
Week 5	Electronic configuration of elements
Week 6	1. Ionization potential (T.P) of Periodic properties, 2- Electron affinity (E.A) ,3- Atomic size
Week 7	Shielding
Week 8	Electronegativity
Week 9	Acid and Base chemistry

Week 10	2.Lewis Acid and Base, Hard base and soft base and hard acid
Week 11	2. Lewis structures 2. Valence bond theory 3. Molecular orbital theory (MOT
Week 12	Ts he MOT of Heteronuclear diatomic molecules
Week 13	Werner theory Chelate ligand VBT of coordination compounds
Week 14	1 st course Mid Term Examination
Week 15	Crystal field theory Factor influence the ligand field splitting

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction of analytical chemistry
Week 2	the identification of the glassware used in the laboratory
Week 3	Exp1. Analysis of Group I
Week 4	Exp 2. Systematic Separation
Week 5	detection of Group II
Week 6	Exp 3. Separation of Group IIA and IIB
Week 7	Analysis of Group (IIA)
Week 8	Separation of Group IIA and IIB ,
Week 9	Analysis of Group (IIA)
Week10	Exp. 4 Separation of Group IIA , IIB
Week 11	Analysis of Group (IIB)cat ion
Week 12	Quiz

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	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	**Mathematic**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**Sci-101**				
ECTS Credits	4				
SWL (hr/sem)	**50**				
Module Level		1	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	**Farah Hazem Mohammed**		**e-mail**	farahalkadoo@uomosul.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/07/2023	**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–تعرف الطالب على الاعداد الحقيقية 2–كيفية استخدام الغايات في الاشتقاق 3–تعرف الطالب على الاشتقاق والتكامل وقواعدهما 4–تعرف الطالب على الدوال المتسامية واشتقاقها وتكاملاتها 5–تعرف الطالب على الدوال المثلثية والدوال العكسية
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	١-فهم وتطبيق مجموعة متنوعة من الاساليب الرياضية: يتعلم الطالب مجموعة متنوعة من الطرق والاساليب الرياضية المختلفة التي يمكن استخدامها لحل المسائل الرياضية المعقدة ٢–تطوير مهارات التفكير النقدي: يتم تعزيز مهارات التحليل والتركيب والتفكير النقدي عندما يتعلم الطلاب طرقا رياضية . يتم تشجيع الطلاب على التفكير بشكل منهجي والتحليل العميق للمسائل الرياضية ٣–القدرة على حل المسائل الرياضية المعقدة: يتعلم الطلاب كيفية تحليل وفهم المسائل الرياضية المعقدة وتطبيق الاساليب والتقنيات الرياضية المناسبة لحلها بشكل صحيح. ٤–التفكير الابداعي والابتكار: يشجع تعلم طرق رياضية على التفكير الابداعي والابتكار في مجال حل المسائل الرياضية. يتعلم الطلاب كيفية تطوير حلول جديدة وفريدة باستخدام الاساليب الرياضية
Indicative Contents المحتويات الإرشادية	1-التعرف على الاعداد الحقيقية (١٥ساعة) 2–استخدام الغايات(١٥ساعة) 3–الاشتقاق والتكامل وقواعدهما(١٥ساعة) 4–الدوال المتسامية(١٥ساعة) 5–الدوال المثلثية والدوال العكسية(١٥ساعة)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	الإستراتيجية الرئيسية التي سيتم تبنيها في تقديم هذه الوحدة هي تشجيع الطلاب في التمارين، وفي الوقت نفسه تقوم بتحسين وتوسيع مهارات التفكير الناقد. سيتم تحقيق ذلك من خلال الفصول الدراسية، والدروس التفاعلية، ومن خلال النظر في نوع التجارب البسيطة التي تنطوي على بعض انشطة اخذ العينات المثيرة للاهتمام للطلاب

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	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
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 #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري	
	Material Covered
Week 1	مقدمة في الاعداد الحقيقية
Week 2	القيمة المطلقة والمبرهنات المتعلقة بها
Week 3	الغايات
Week 4	امتحان يومي
Week 5	تعريف المشتقة باستخدام الغاية
Week 6	الاشتقاق وقواعده
Week 7	التكاملات والامثلة عليها
Week 8	دالة اللوغاريتم الطبيعي

Week 9	الدالة الاسية
Week 10	امتحان يومي
Week 11	الدالة الاسية العامة
Week 12	الدالة اللوغاريتمية العامة
Week 13	الدوال المثلثية
Week 14	الدوال العكسية
Week 15	امتحان نهائي الكورس الاول

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		
Recommended Texts		
Websites		

Grading Scheme
مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	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	حقوق الانسان والديمقراطية Democracy and Human Right			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOM-104**				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		1	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	تكتب اسمك هنا		**e-mail**	الايميل الجامعي	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/08/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	أ -المعرفة والفهم) الاهداف المعرفية(أ -1ان يكون الطالب ملماً بمفاهيم حقوق الانسان والديمقراطية ويكتسب الوعي والثقافة السياسية. أ -2يستطيع ان يميز بين المصطلحات والمفاهيم المختلفة مثل (حقوق الانسان، الدمقرطة، الديمقراطية، الانتقال الديمقراطي، العدالة الانتقالية.(أ -3القدرة على تحليل تطورات حقوق الانسان والمراحل التي مرت بها. أ -4ان يكون قادرا على ادراك واستيعاب الاعلانات والمواثيق الدولية لحقوق الانسان مثل الاعلان العالمي لحقوق الانسان. أ -5ان يكون قادرا على التعبير عن راية بخصوص واحترام اراء الاخرين . أ -6ان تكون لدية القدرة على تحليل اي مشكلة ووصفها والتنبأ بمستقبل الظاهرة السياسية . أ7- ان يتعرف على انواع الديمقراطية والتمييز فيما بينها داخل النظم السياسية المعاصرة. ب - المهارات الخاصة بالموضوع) الاهداف المهاراتية الخاصة بالمقرر(ب — 1اكتساب الطالب لمهارات التفاوض والتواصل وتبادل الاراء مع الاخرين. ب – 2 اكتساب الطالب مهارات الحوار البناء الهادف . ب – 3 اكتساب الطالب مهارات مواجهة اي موقف والتعبير عن الراي بكل شجاعة وثقة بالنفس. ج- مهارات التفكير ج1- مهارات التحليل. ج2- مهارات التوظيف للمفردات التي تعلمها في الواقع العملي من خلال دراسة مشكلات محددة من الواقع. ج3- مهارات التنبؤ والدراسات المستقبلية للنظم الديمقراطية. د - المهارات العامة والمنقولة (المهارات الأخرى المتعلقة بقابلية التوظيف والتطور الشخصي). د1- القدرة على العمل كفريق. د2- التفاعل مع فريق العمل لتحقيق المهارات المطلوبة. د3- القدرة على القيام بعرض نظري لبعض الموضوعات ذات العلاقة بمفردات المادة. د4- اكتساب مهارات التحليل العلمي لاي ظاهرة سياسية تتعلق بحقوق الانسان.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1.عرف المفاهيم الاتية: حقوق الانسان، الشرعة الدولية، الديمقراطية، الدمقرطة، التحول الديمقراطي. 2. وضح اهمية الحقوق السياسية والمدنية. 3. اذكر اهم ما جاء في المواثيق الدولية لحقوق الانسان فيما يخص حق الحياة. 4. تكلم باختصار عن انواع الحقوق الاقتصادية والاجتماعية والثقافية. 5.ناقش ما جاء في الدستور العراقي لعام 2005 النافذ من ضمانات فيما يخص حقوق الانسان. 6.حدد اهم خصائص النظام الديمقراطي 8.اشرح انواع الديمقراطية ثم بين اهم الانواع القابلة للتطبيق العملي. 9.عدد مع الشرح انواع النظم الانتخابية. 10.ناقش الاطار الوظيفي للسلطة التشريعية ضمن مؤسسات النظام السياسي العراقي وفق ما جاء في دستور عام 2005. 11.حدد الاطار البنيوي للمؤسسة التنفيذية في النظام السياسي العراقي وفق دستور 2005. 12.تكلم عن اختصاصات مجلس النواب في اطار المؤسسة التشريعية. 13. ناقش شروط انتخاب رئيس الجمهورية وفق الدستور العراقي لعام 2005.
Indicative Contents المحتويات الإرشادية	يتضمن المحتوى الإرشادي ما يلي. مفهوم حقوق الانسان وتطور الحقوق تاريخياً يتناول تعريف الحق وتعريف الانسان، تعريفاً لغوياً واصطلاحياً واجرائياً، خصائص حقوق الانسان، ثم التطور التاريخي لحقوق الانسان، من العصور القديمة مروراً بالعصور الوسطى والحديثة، ومن ثم حقوق الانسان المعاصرة، وما انبثق منها من اشكال واجيال لحقوق الانسان، وانواع ومصادر حقوق الانسان ومن ضمنها الحقوق المدنية والسياسية والحقوق الاقتصادية والاجتماعية والثقافية، وحقوق الانسان في المواثيق الدولية والتشريعات الوطنية، والتحديات العالمية لحقوق الانسان ومن ضمنها التحديات الثقافية مثل العولمة والتطور التكنولوجي، والتحديات السياسية مثل الارهاب والحروب اللامتماثلة والحروب بين الدول. (5 ساعات) حقوق الانسان والحريات العامة في الدستور العراقي

يتناول ما تضمنه الدستور العراقي من ضمانات قانونية لحماية حقوق الانسان وحرياته العامة، وانواع تلك الضمانات. (ساعتان). الحريات العامة والديمقراطية يتناول التطور التاريخي للديمقراطية، في الحضارات القديمة لاسيما في دول المدن اليونانية، مروراً بالديمقراطية عند المفكرين الغربيين امثال توماس هوبز ومونتسكيو وجان جاك روسو، ثم النماذج التقليدية للديمقراطية (انواع الديمقراطية)، المباشرة وغير المباشرة وشبه المباشرة، وخصائص وشروط النظام الديمقراطي، وانواع النظم الانتخابية في الانظمة الديمقراطية. (3 ساعات). الديمقراطية في نظام الحكم العراقي وفق دستور 2005 يتناول الاطار البنيوي لمؤسسات النظام السياسي العراقي، بنية المؤسسة التشريعية المكونة من مجلس النواب ومجلس الاتحاد، وبنية المؤسسة التنفيذية المكونة من رئيس الجمهورية ومجلس الوزراء، وبنية المؤسسة القضائية المكونة من مجلس القضاء الاعلى والمحكمة الاتحادية العليا، محكمة التمييز الاتحادية، وجهاز الادعاء العام، وهيئة الاشراف القضائي، والمحاكم الاتحادية الاخرى، ثم الاطار الوظيفي واختصاصات مؤسسات النظام السياسي العراقي (التشريعية، التنفيذية، القضائية)، واخيراً العلاقة بين السلطات (التوازن والتعاون، والفصل بين السلطات). (4 ساعات).	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. المحاضرة المصحوبة بالشرح والتحليل. 2. الحلقة النقاشية. 3. التقارير والبحوث. 4. عرض المادة عبر شرائح (بوربوينت) . 5. الاسئلة والاجوبة. 6. المشاركة الصفية .

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
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 #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	مفهوم حقوق الانسان
Week 2	التطور التاريخي لحقوق الانسان
Week 3	اشكال واجيال حقوق الانسان
Week 4	حقوق الانسان في المواثيق الدولية
Week 5	التحديات العالمية لحقوق الانسان
Week 6	الحقوق المدنية والسياسية والاقتصادية
Week 7	حقوق الانسان والحريات العامة في الدستور العراقي
Week 8	الحريات العامة والديمقراطية
Week 9	التطور التاريخي للديمقراطية
Week 10	النماذج التقليدية للديمقراطية (انواع الديمقراطية)
Week 11	خصائص وشروط النظام الديمقراطي
Week 12	الديمقراطية في نظام الحكم العراقي وفق دستور 2005
Week 13	الاطار البنيوي لمؤسسات النظام السياسي العراقي (التشريعية، التنفيذية، القضائية)
Week 14	الاطار الوظيفي واختصاصات مؤسسات النظام السياسي العراقي (التشريعية، التنفيذية، القضائية)
Week 15	اختبار

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر		
	Material Covered	لا يوجد
Week 1	Lab 1:	
Week 2	Lab 2:	
Week 3	Lab 3:	
Week 4	Lab 4:	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. حافظ علوان حمادي الدليمي، حقوق الانسان، وزارة التعليم العالي والبحث العلمي، جامعة بغداد، 2013. 2. محمد سليم محمد، نظرات حول الديمقراطية، دار وائل للطباعة، عمان، 2000.	Yes Yes
Recommended Texts	1. بهاء الدين ابراهيم واخرون، حقوق الانسان بين التشريع والتطبيق، دار الجامعة الجديدة، الاسكندرية، 2008. 2. الدستور العراقي الدائم لعام 2005، الامانة العامة لمجلس الوزراء، بغداد، 2006.	Yes Yes
Websites	https://www.coe.int/en/web/compass/democracy.	

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	**Arabic**			**Module Delivery**	
Module Type	**B**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOM- 101**				
ECTS Credits	2				
SWL (hr/sem)	**50**				
Module Level		1	**Semester of Delivery**		1
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader			**e-mail**		
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	

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	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
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 #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	AL-Dabbagh. T.H. (2017) The Earth_/... An Introduction to Physical geology First edition. 366P.	Yes
		Yes

Recommended Texts	**Thompson Graham R, Turk Jonathen, 2011. Earth, what inside, Student Edition, Brookes/ Cole, cengage learing**	Yes No
Websites		

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

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**General Geology II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-1214**				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rafee Ibrahim Al-Humidi		**e-mail**	Rafeegeo66@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Myasar Sameer		**e-mail**	myasar.sameer@uomosul.edu.iq	
Peer Reviewer Name	Falah Abed Al-Miamary		**e-mail**	falahabed@uomosul.edu.iq	
Scientific Committee Approval Date	22/04/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**General Geology I**	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The study aims to introduce students in the first stage to the science of geology and all its branches and specializations. This is done by giving preliminary introductory lectures in a simplified and in-depth manner to all the disciplines that the student will learn in the coming stages, so that he will be prepared later to delve deeper into those disciplines when he learns them in the future. Students will be taught structural geology, surface and groundwater science. And take an important look at the theory of plate tectonics. Introducing students to historical geology and the most important rules adopted in determining geological time in both its relative and absolute types, the geological time scale and stratigraphy with its main lines. تهدف الدراسة الى تعريف الطلاب بالمرحلة الأولى بعلم الجيولوجيا وكافة فروعه وتخصصاته، ويتم ذلك عن إعطاء محاضرات أولية تعريفية بصورة مبسطة وغير معمقة لكل التخصصات التي سيتعلمها الطالب بالمراحل القادمة ليكون مهيأ فيما بعد للتعمق بتلك التخصصات حين يتعلمها مستقبلا. حيث سيتم تعليم الطلاب على الجيولوجيا التركيبية، وعلم المياه السطحية والجوفية . والقاء نظرة مهمة عن نظرية الصفائح التكتونية. وتعريف الطلبة بالجيولوجيا التأريخية وأهم القواعد المعتمدة في تحديد الزمن الجيولوجي بنوعيه النسبي والمطلق والسلم الزمني الجيولوجي وعلم الطبقات بخطوطه الرئيسية
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- The study of structural geology and its connection with earth movements and mountain-building movements, the formation of folds of all kinds, faults and breaks in their main divisions, and a study of cartography, especially geological maps 2- And he touched on the flow of water, the water cycle in nature, the river, its deposits, and its divisions 3- Study of lakes and seas and their divisions according to geology. 4- Studying the theory of tectonic plates, their types, shapes, and sizes, and their role in the formation of the Earth's surface and the variation in the locations of the continents and seas during geological time. 5- Study of Historical geology and the determination of relative time and the most basic rules in determining it. And compare it to the absolute age and how to determine the absolute age 6- Study of the science of strata (stratigraphy), their types, the boundaries between them, their rock, biological, and Cronos units, and comparison between them. دراسة الجيولوجيا التركيبية وأرتباطها بالحركات الأرضية والحركات البانية للجبال، وتكون الطيات بأنواعها والفوالق والفواصل بتقسيماتها الرئيسية، والتطرق لعلم الخرائط وخصوصا الخرائط الجيولوجية . والتطرق الى غلم المياه ودورة المياه في الطبيعة والنهر وترسباته وأقسامه، دراسة البحيرات والبحار وتقسيماته حسب علم الجيولوجيا. دراسة نظرية الصفائح التكتونية أنواعها وأشكالها وأحجامها ودورها في تشكل سطح الأرض وتغاير مواقع القارات والبحار خلال الزمن الجيولوجي. الجيولوجيا التأريخية وتحديد الزمن النسبي وأهم القواعد الأساسية في تحديده. ومقارنته بالعمر المطلق وكيفية تحديد العمر المطلق. والأشارة الى علم الطبقات وأنواعها والحدود بينها وتقسيماتها الصخرية والحياتية والزمنية، والمضاهاة بينها.
Indicative Contents المحتويات الإرشادية	Geologic structure, Introduction, Rock deformation, Dip and Strike, Outcrop, Folds, Types of folds. Faults, Dip-slip fault, Strike-slip fault, Oblique-slip faults, Joints. Geological map, Introduction, Type of Geological map. Hydrogeology, Introduction, The hydrologic cycle, Running water, Stream velocity, Drainage patterns, River erosion.

	River transportation of sediments, River deposition, The stage of river evolution, Delta, Alluvial fan, Lakes. Groundwater, Source of ground water, Porosity and permeability, The water table. Aquifers, Types of aquifers, Springs, Geysers. Glacier, Introduction, Glacier formation, Type of glacier, Glacial movement, Erosion and transport by glaciers, Glacial deposits. Plate tectonics, Introduction, Continental drift hypothesis, Evidence of continental drift, Seafloor spreading. Plat tectonics theory, Plates boundaries, The driving mechanism of plate tectonic, Mantle plumes and hot spots. Geological Time, Introduction, Geological time and uniformitarianism , Relative geological time, Fossils, The requirements for fossilization. The five Determination of relative ages, Unconformity, Correlation of rock unit, index fossils. The Geological Time Scale Absolute Geologic Time, Radioactivity Decay and Half-lives

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teach students how to distinguish the types of folds, the types of faults and joints, and the reasons that led to the occurrence of these deformations on rocks. How do students motivate the reason for observing the current rivers, how to distribute their sediments, and the variation in the sizes of these sediments during the river section? The students urged the reason for the accuracy of the observation during their field observations of the succession of rock layers in terms of rock and color variation and lateral and vertical extension. Focusing on searching through the layers for fossils and their effects because they have a role in determining the works of those rock layers. تعليم الطلاب كيفية تمييز أنواع الطيات وأنواع الفوالق والفواصل، والأسباب التي أدت الى حدوث هذه التشوهات على الصخور. كيف يحفز الطلبة علة مراقبة الأنهار الحالية وكيفية توزيع رواسبها وتغاير أحجام هذه الرواسب خلال المقطع النهري. وحث الطلبة علة دقة الملاحظة خلال مشاهداتهم الحقلية لتتابع الطبقات الصخرية من حيث التغاير الصخري واللوني والأمتداد الجانبي والعمودي. والتركيز على البحث خلال الطبقات عن المتحجرات ةأثارها لما لها دور في تحديد أعمال تلك الطبقات الصخرية.

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..2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	7.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري

	Material Covered
Week 1	Geologic structure, Introduction, Rock deformation, Dip and Strike, Outcrop, Folds, Types of folds. Faults, Dip-slip fault, Strike-slip fault, Oblique-slip faults, Joints..
Week 2	Geological map, Introduction, Type of Geological map.
Week 3	Hydrogeology, Introduction, The hydrologic cycle, Running water, Stream velocity, Drainage patterns, River erosion.
Week 4	River transportation of sediments, River deposition, The stage of river evolution, Delta, Alluvial fan, Lakes.
Week 5	Groundwater, Source of ground water, Porosity and permeability, The water table. Aquifers, Types of aquifers, Springs, Geysers.
Week 6	Glacier, Introduction, Glacier formation, Type of glacier, Glacial movement, Erosion and transport by glaciers, Glacial deposits.
Week 7	Plate tectonics, Introduction, Continental drift hypothesis, Evidence of continental drift, Seafloor spreading.
Week 8	Plat tectonics theory, Plates boundaries, The driving mechanism of plate tectonic, Mantle plumes

	and hot spots.
Week 9	**Geological Time, Introduction, Geological time and uniformitarianism.**
Week 10	**Relative geological time, Fossils, The requirements for fossilization**.
Week 11	**The five Determination of relative ages, Unconformity, Correlation of rock unit, index fossils.**
Week 12	**The Geological Time Scale**
Week 13	**Absolute Geologic Time, Radioactivity Decay and Half-lives**
Week 14	Summary.
Week 15	**Field trip**.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Lab 1:** Introduction and definition of cartography
Week 2	**Lab 2:** Contents and types of maps
Week 3	**Lab 3:** Topographic and contour maps
Week 4	**Lab 4:** How to create a contour map
Week 5	**Lab 5:** Contour mapping
Week 6	**Lab 6:** Identify the major and minor terrain features from contour maps
Week 7	**Lab 7:** How to draw topographic sections from contour maps (profile)
Week 8	**Lab 8:** An introduction to how to identify the position of the layers from the map
Week 9	**Lab9:** Horizontal layers
Week10	**Lab 10:** Vertical layers
Week 11	**Lab 11:** Oblique layers
Week 12	**Lab 12:** How to project bedding attitudes on a geological section

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**AL-Dabbagh. T.H. (2017) The Earth_/… An Introduction to Physical geology First edition. 366P.**	Yes

		Yes
Recommended Texts	Thompson Graham R, Turk Jonathen, 2011. Earth, what inside, Student Edition, Brookes/ Cole, cengage learing	Yes No
Websites	https://www.youtube.com/watch?v=rAYiBSo3JKY https://www.youtube.com/watch?v=bFP4rCJcKd8	

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	**Mineralogy**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-1205**				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level		UG1	**Semester of Delivery**		TWO
Administering Department		Geology science	**College**	science	
Module Leader	Flyah Hassan Abbas		**e-mail**	flyahabas@uomosul.edu.iq	
Module Leader's Acad. Title		lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Safwan Fathi H. Al-Lhaebi		**e-mail**	safwanfathi@uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		03/03/2024	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Crystallography	**Semester**	1

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية ***يتم كتابة اهم الأهداف التي تغطيها هذه المادة الدراسية بشكل جمل او فقرات توضح المواضيع التي سيتم التطرق اليها و دراستها و معالجتها)***	1. Clarification of how studying this course can make significant contributions to the mineralogy field. 2. Identify the principles of mineralogy and the study of the chemical and physical properties of minerals . 3. This course deals with Environments of Minerals Formation. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic 5. To understand the classification of minerals and importance of each type. 6. This course employs how to deal with minerals, their locations and methods of diagnosis through their physical and chemical properties.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية ***يتم كتابة اهم المُخرجات او الناتج و الكَم العلمي الذي يتم استخدامه للتدريس في هذه المادة على شكل أسئلة أساسية تخص منهاج المادة بأكمله و يجب ان لا تقل هذه المُخرجات من ناحية العدد عن 6 مُخرجات و يفضل ان تكون بعدد أسابيع الدراسة.***	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Define mineralogy and describe its tool types. 2. Definitions of main terms and methods of mineralogy 3. Description the environments of minerals formation.. 4. Summarize what is meant Polymorphism, Pseudomorphism, Coordination of Ions. 5. Discuss the Classification of Minerals. 6. Explanation of the silicate minerals. 7. Interpretation the classification of Silicate Minerals. 8. Define Silicate Minerals and describe its types. 9. Explanation of Non Silicate Minerals. 10. Discuss the importance each type of silicate and non silicate mineral..
Indicative Contents المحتويات الإرشادية ***يتم كتابة اهم العناوين الرئيسية للمواضيع بشكل متسلسل و التي تشمل كافة الفقرات التي تحتويها مع إدراج عدد الساعات المطلوبة لتنفيذ كل فقرة.***	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction , Composition of the Earth's crust, Physical Properties of Minerals, Crystal form and habit, Color, Streak, Luster, Transparency, Hardness, Cleavage, Fracture, Specific gravity, Environments of Minerals Formation, The Magmatic Environment, The Sedimentary Environment, The Metamorphic Environment. [10 hrs] Polymorphism, Pseudomorphism, Coordination of Ions, Silicate Minerals, Classification of Silicate Minerals,. [8 hrs] Nesosilicates, Sorosilicates, Cyclosilicates, Inosilicates, Phyllosilicates, Tectosilicates, Non Silicates, [10 hrs] Non Silicates, Native Elements, Sulfides (including arsenides and sulfarsenides), Oxides, Hydroxides, Halides, Carbonates, Sulfates, Phosphates . [8 hrs] Revision problem classes [3 hrs] <u>Part B – Practical labs</u> An introduction to mineralogy, Physical properties of minerals, Properties of Silicate Minerals, Diagnosis and characteristics of Nesosilicates and Sorosilicates, Diagnosis

	and characteristics of Cyclosilicates and Inosilicates, Diagnosis and characteristics of Phyllosilicates, Tectosilicates. [18 hrs] Properties of Non Silicate Minerals, Diagnosis and characteristics of Native Elements, Diagnosis and characteristics of Sulfides group and Sulphates group, Diagnosis and characteristics of Oxides group and Hydroxides group, Diagnosis and characteristics of Carbonates group , Halides group and Phosphates group . [18 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies *يتم كتابة ملخص الاستراتيجية الرئيسية التي سيتم تبنيها في تقديم هذه المادة*	The course includes the principles of mineralogy and the study of the chemical and physical properties of minerals, the study of mineral deposition environments as well as classification of minerals. The course also includes learning about the importance of minerals, how to diagnose minerals, how to examine them and their properties, and thus identify them.

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	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	107	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري	
	Material Covered
Week 1	An introduction to mineralogy.
Week 2	physical and chemical properties of minerals .
Week 3	Environments of Minerals Formation.
Week 4	Polymorphism, Pseudomorphism, Coordination of Ions.
Week 5	Silicate Minerals.
Week 6	Classification of Silicate Minerals.
Week 7	Nesosilicates, Sorosilicates.
Week 8	Cyclosilicates, Inosilicates.
Week 9	Phyllosilicates, Tectosilicates.
Week 10	Non Silicates.
Week 11	Native Elements.
Week 12	Sulfides group, Sulphates group.
Week 13	Oxides group , Hydroxides group.
Week 14	Carbonates group , Halides group , Phosphates group.
Week 15	General review.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: An introduction to mineralogy.
Week 2	Lab 2: Physical properties of minerals .
Week 3	Lab 3: Properties of Silicate Minerals.
Week 4	Lab 4: Diagnosis and characteristics of Nesosilicates and Sorosilicates.
Week 5	Lab 5: Diagnosis and characteristics of Cyclosilicates and Inosilicates.
Week 6	Lab 6: Diagnosis and characteristics of Phyllosilicates, Tectosilicates.
Week 7	Lab 7: Properties of Non Silicate Minerals.

Week 8	Lab 8: Diagnosis and characteristics of Native Elements.
Week 9	Lab9 : Diagnosis and characteristics of Sulfides group and Sulphates group.
Week10	Lab 10: Diagnosis and characteristics of Oxides group and Hydroxides group.
Week 11	Lab 11: : Diagnosis and characteristics of Carbonates group , Halides group and Phosphates group.
Week 12	Lab 12: General review.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**John, J (2015):** Introducing mineralogy. Dunedin Academic, 126p. **Nesse, W. D. (2018) :** Introduction to Mineralogy : Oxford University, 514p.	Yes Yes
Recommended Texts	**Haldar, S.K. and Josip, T. (2014) :** Introduction to Mineralogy and Peetrology: Elsevier Inc , 338P.	No
Websites		

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Physics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**GEO-1206**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	1		**Semester of Delivery**	2	
Administering Department			**College**	SCI	
Module Leader			**e-mail**		
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Khudhur Ali Salah		**e-mail**	khederali@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	1- Kinematics 2- A body moving at constant velocity and acceleration 3- Instantaneous velcity and acceleration 4- Freely falling 5- Projectile motion 6- Light and electromagnetic field	**Semester**	

	7- The law of reflection 8- Types of mirrors		
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This course will be used to momitor students performance
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Students will learn various techniques for performing physical problems
Indicative Contents المحتويات الإرشادية	Students will have provided in response to the questions Theoretical lectures 12 hours

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategie	Expanding students perveptions about this subjects

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	6.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
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 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week10	
Week 11	
Week 12	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	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	**Statistics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-1207**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	1		**Semester of Delivery**	2	
Administering Department			**College**		
Module Leader			**e-mail**		
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	–
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	–
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategie	

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	3.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.3
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 #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts		
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer**			**Module Delivery**	
Module Type	**Core**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOM-103**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	GEO		**College**	SCI	
Module Leader	Adil Murad Awad		**e-mail**	amawad@uomosul.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Sanad Abdulelah Mahmood		**e-mail**	drsanadalkhashab@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date			**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	This program is meant for those students who have low-level literacy in computer use and only partial understanding of the functions of a computer. And so, the students are introduced to this program to improve computer literacy. The students must apply their knowledge to use office skills before use the advanced geology software. – Describe why computers are important. – Explain how computers work. – Explain the difference between computer hardware and computer software. – Describe what an operating system is. – Identify the operating system you have on your own computer and phone. – Explain office productivity and communications software. – Start up and shut down computers properly. – Use the mouse and keyboard to complete tasks on the computer. – Identify the different groups of keys on the computer. – Create, open, save, and manage files and folders
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	– Understand basic computer terminology. – Identify components of a computer and peripheral devices. – Perform the basic computer functions by using a desktop or a laptop. – Develop an understanding of word processing capabilities of a computer. – Understand the concept and usage of the Internet and e-mails. – Use the acquired skills to pursue employment opportunities. – Enhance their computer literacy to be ready for advanced geology softwa Describe why computers are important. – Explain how computers work. – Explain the difference between computer hardware and computer software. – Describe what an operating system is. – Identify the operating system you have on your own computer and phone. – Explain office productivity and communications software. – Start up and shut down computers properly. – Use the mouse and keyboard to complete tasks on the computer. – Identify the different groups of keys on the computer. – Create, open, save, and manage files and folders .
Indicative Contents المحتويات الإرشادية ***يتم كتابة اهم العناوين الرئيسية للمواضيع بشكل متسلسل و التي تشمل كافة الفقرات التي تحتويها مع إدراج عدد الساعات المطلوبة لتنفيذ كل فقرة.***	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction, Computer Basics Presentation • Mouse Training Presentation • Keyboarding Presentation • File Management Presentation • Mouse Practice Spreadsheet. Introduction to the world of Computers, Computer and Word Processing, Using the Internet, Using E-mail, Application of

	Microsoft office, Word, Excel, PowerPoint, Access. [*18* hrs] Part B –lab Work: Student applied and do practice all the lectures and according to sequences of lectures. . [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategie	Expanding students' perceptions about this science and its contents it includes that help in using computer and the obtained skills to communicate with geology software in addition to applying the digital learning in the critical condition like natural pandemic or restrictions of social distancing. In addition to the use of different computerized skills in learning. This will be achieved through lectures, labs, and interactive tutorials and by types of practical diagnostic methods for digital learn in and involving some software activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	12	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Orientation, Syllabus
Week 2	Introduction of Computer World.
Week 3	Using the computer and Managing Files using Windows O. S
Week 4	Concept of information and Communication technology
Week 5	hardware components
Week 6	Office Software
Week 7	Word (interface language)
Week 8	Word (files and editing)
Week 9	Word (format features)
Week 10	Word (table and outcome)
Week 11	Power point (interface language)
Week 12	Power point (menus and slide design)
Week 13	Power point (animation effects)
Week 14	Excel (interface language)
Week 15	Access (basic practice)

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1. Managing Files using Windows O. S
Week 2	Lab 2. Communication technology Web design and browsering
Week 3	Lab 3. Word (interface language)
Week 4	Lab 4. Word (files and editing)
Week 5	Lab 5. Word (format features)
Week 6	Lab 6. Word (table and outcome)
Week 7	Lab 7: Power point (interface language)
Week 8	Lab 8. Power point (menus and slide design)
Week 9	Lab9: Power point (animation effects)
Week10	Lab 10: Excel (interface language)
Week 11	Lab 11: Access (basic practice)
Week 12	Lab 12: Project Work

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Computer Basics for Beginners with Pictures and Stories (IT's Story) Paperback – December 26, 2021** **by Hena Kim (Author)ICDL Excel: A step-by-step guide to spreadsheets using Microsoft Excel**	Yes Yes
Recommended Texts	**Windows 11 for Seniors: The Most Complete Easy-to-Follow Guide to Master Your New PC. Unlock All Their Features with Step-by-Step Illustrated Instructions and Useful Tips and Tricks Paperback – July 22, 2022** https://www.youtube.com/watch?v=z2r-p7xc7c4	Yes No
Websites	https://icdl.ie/app/uploads/2021/04/ICDL-References.pdf https://www.keyhero.com/typing-practice/ https://www.speedtypingonline.com/user/hero.o/test-stats	

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	English Language			**Module Delivery**	
Module Type	B			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**UOM -102**				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Medical Physics		**College**	Science	
Module Leader	Younis Hamad Ahmed		**e-mail**	younis.h81@uomosul.edu.iq	
Module Leader's Acad. Title	Teaching Assistant		**Module Leader's Qualification**	MA	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	/02/2024		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Familiarizing students with the basics of the English language. Also, breaking the barrier of shyness and increasing their confidence inside and outside the classroom. There is a big chance to get them engaged in short discussions where they can write or verbally express themselves. In addition to these above, the course will improve their reading, writing, listening and speaking skills as students where English language is the main medium of communication throughout their courses.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Creating full awareness of correct usage of English grammar in writing and speaking. 2- Realizing the importance of the English language inside and outside of university life. 3- Students will improve their speaking ability in English both in terms of fluency and comprehensibility. 4- Students will review the grammatical forms of English and the use of these forms in specific communicative contexts, which include: class activities, homework assignments, reading of texts and writing. 5- Increasing their reading speed and comprehension of academic articles. 6- Students will improve their reading fluency skills through extensive reading. 7- Students will enlarge their vocabulary by keeping a vocabulary journal. 8- Students will strengthen their ability to write short paragraphs and summaries using the process approach.
Indicative Contents المحتويات الإرشادية	Part A – Theoretical lectures Introduction about communication in general and especially the English language, with an introduction on the word classes (parts of speech) in the English language [4 hrs]. Explaining every part of speech in the English language such as nouns, pronouns, verbs, adjectives, adverbs, prepositions, conjunctions and interjections [16 hrs]. Moving on to Vocabulary teaching where students will study some strategies and learn new methods of memorizing any set of vocabulary [4 hrs]. Main skills in learning the English language: speaking, listening, reading and writing are also delivered gradually during the last weeks [6 hrs]. The last part is dedicated to some error correction and feedback sessions [2 hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Encourage Learners to 'Stretch' Their Styles. This is a very important point as learners are not 100 percent one type or another. For example, of the analytical/global learning styles. Analytical learners work more effectively alone and at their own pace. Global learners, on the other hand, work more effectively in groups. 2. Do Not Privilege Any One Style Over Another. The general consensus is that while styles differ, one is not necessarily superior to the other. In other words, learners who prefer to study alone will not necessarily be better learners than those who prefer to learn by listening. According to this view, analytical learners should be given the opportunity to spend more time studying alone than in groups, but they should also be given the chance to work in groups. 3. Be Aware of the Relationship Between Learning Styles and Teaching Styles. The reason is that if your style as a teacher is at odds with the learning styles of some of your students, then the effectiveness of your teaching may be limited. If you have a collaborative teaching style, then the way you run your classroom may not suit authority-oriented learners who want the teacher to tell them what to do. If your teaching style is authoritative, even authoritarian, then you may not be suited to students who value autonomous learning.

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	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.5
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	3	15% (15)	2, 5, and 9	LO #2, #5, #8
	Assignments	2	10% (10)	4 and 8	LO #4 and #8
	Projects / Lab.				
	Report	3	15% (15)	3, 6 and 7	LO #3, #6 and #7
Summative assessment	Midterm Exam	2hr	10% (10)	7	ALL
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري	
	Material Covered
Week 1	An introduction on communication and English language.
Week 2	Parts of Speech (word classes).
Week 3	Nouns & their types.
Week 4	Pronouns in English language.
Week 5	Verbs in the English language.
Week 6	Adjectives and their types.
Week 7	Adverbs and their uses.
Week 8	Prepositions in English language.
Week 9	Conjunctions in English Sentences.
Week 10	Interjections in English Sentences.
Week 11	Vocabulary Improving Skills.
Week 12	Basic Speaking Skills.
Week 13	Basic Reading Skills.
Week 14	Basic Writing Skills
Week 15	Basic Listening Skills

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered

Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week10	
Week 11	
Week 12	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Murphy, R. (1985). *English Grammar In Use*. CUP.**	Yes
Recommended Texts	**Sullivan, N. (2015). *Essential Grammar*. Routledge.**	No
Websites	https://www.pdfdrive.com/essential-grammar-for-todays-writers-students-and-teachers-e165838835.html	

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	**Paleontology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-2309**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UGII	**Semester of Delivery**		3
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Omar Ahmed Mawlood		**e-mail**	omarbadrani@uomosul.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Omar Ahmed Mawlood		**e-mail**	omarbadrani@uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Clarification of how paleontology can make significant contributions to a wide range of scientific problems in geosciences. Identify two fossil groups (Trilobite and Echiniod) which are useful in Geosciences. This course deals with the basic concept of the most important and discriminatory morphological characters, anatomical, and taxonomic aspects of each fossil group. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. To understand and comprehend the impact of these groups on ecology, distribution, and paleoecology. 6. To perform different micropaleontology applications.
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. List with description, the different groups of organisms and the kingdoms that belong to them. 2. Define the various terms associated with paleontology. 3. What is trilobite? Definition, measurement of shell, orientation and importance in geoscience. 4. Summarize what is meant by external and internal features and structures of ostracode. 5. Discuss the reaction and involvement of trilobite in paleoecology, distribution, paleoclimat and stratigraphy. 6.Define Echiniod. 7. Identify the Echiniod and graptolite. 8. Explain the Echiniod morphology and formation. 9. List and Describe the Ecology and distribution of Echiniod. 10. Discuss the Functions of parts of Echiniod. 11. Identify the relation of Echiniod with climate changes. 12. Terminology.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures Introduction, organisms groups , types of fossils, taxonomic position , general characteristic of ostracoda, importance of ostracoda study (as fossils), morphology of Echiniod, Echiniod parts , description of margins, features and structures used for the orientation of the shell, external feature, internal features, terminology of Echiniod, dimorphism. [10 hrs] ,Ecology, distribution of marine Echiniod, factors controlled of the distribution of Echiniod, distribution of environments according to the salinity levels, Paleoecology. [8 hrs] coccolithophores, trilobite , graptolite morphology and formation. [10 hrs] Ecology of Echiniod, functions of shell, geologic distribution, effect of marine change on distribution, evolutionary responses, terminology of Echiniod. [8 hrs] Revision problem classes [3 hrs] Part B – Practical labs Shape, measurements of shell and parts, orientation, features, external structures, internal structures, ornamentation, description of some index species. [18 hrs] graptolite shape, Echiniod orientation, Echiniod size, ultrastructural component, element arrangement , orientation in plan view, crystallography, systematic paleontology, description of some index species. [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expanding students' perceptions about this science and its contents it includes that help in stratigraphic, paleoecologic, and paleoclimatic analysis. In addition to the use of distinguishing the types of fossils through observations of the shape and structures and their diagnosis. This will be achieved through lectures, labs, and interactive tutorials and by types of practical diagnostic methods for fossils and 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	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري	
	Material Covered
Week 1	Groups and kingdoms of organisms and types of fossils.
Week 2	An introduction to trilobite, its definition, taxonomic status and importance.
Week 3	General characteristics of trilobite, morphology, soft and calcareous parts.
Week 4	Features and structures used in directing shields and shells.
Week 5	features and structures.
Week 6	features and structures.
Week 7	Important terms (terminology).
Week 8	Ecology and palaeoenvironment of trilobite.
Week 9	Distribution of marine trilobite.
Week 10	Introduction to Echiniod.
Week 11	Terminology related to the Echiniod, Terminology related to Echiniod.
Week 12	Echiniod environment.
Week 13	Echiniod and sedimentation.
Week 14	Echiniod function.
Week 15	systematic paleontology.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Shape, measurements of shapes.
Week 2	Lab 2: Orientation of shell.
Week 3	Lab 3: features, structures.
Week 4	Lab 4: features, structures.
Week 5	Lab 5:.
Week 6	Lab 6:.
Week 7	Lab 7: Description of some index Echiniod species.
Week 8	Lab 8:.Preparing of Echiniod slides.
Week 9	Lab9: Echiniod shape description.

Week10	Lab 10: Echiniod orientation.
Week 11	Lab 11: element arrangement.
Week 12	Lab 12: Description of some index Echiniod species

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

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Sedimentology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-23010**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		2	**Semester of Delivery**		3
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Falah Abed Al-Miamary			falahabed@ uomosul.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Ahmed N. Thanon		**e-mail**	anf1277@uomosul.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		22/04/2024	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	none	**Semester**	
Co-requisites module	General Geology 1	**Semester**	1

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. The student will understand the nature of sedimentary materials. 2. The students will be able to describe the shapes, sizes, fabric and porosity of sedimentary rocks. 3. The students will be able to will be able to understand how sedimentary rocks originate through a set of processes that begins with weathering, transportation and deposition 4. The students will be able to will be able to understand the processes of transportation, deposition and formation of sedimentary structures. 5. The students will be able to understand the origin of sedimentary structures. 6. The students will be able to classify the different types of sedimentary structures. 7. The students will be able will be able to understand the processes of transportation, deposition and formation of sedimentary structures.
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. What is sedimentary texture and how can it differ from sedimentary structures? 2. Discuss the three main related attributed to sedimentary textures including shape, size and fabric, the genesis of sedimentary textures for siliclastic and non- siliclastic sedimentary rocks. 3. Defining shape of clastic rocks including form, sphericity, roundness, and surface textures. 4. Discuss the factors affecting the shape and how do they originate? 5. What is the significance of surface textures in environmental analysis? 6. Discuss the grain size scales, measuring grain size, graphical and mathematical treatment of grain size data. 7. What are the importance and application of grain size data? 8. Discuss the fabric of sedimentary rocks including grain orientation, grain packing, grain-to-grain relations, and porosity. 9. What are main types of primary and secondary porosity? 10. Discuss the Fundamental of Fluid flow (Reynolds number, Froude number, laminar and turbulent flow).in transportation and deposition of siliciclastic sediments. 11. What are advantages of Reynolds and Froude numbers in sedimentology? 12. Discuss the transporting agents and their effects, types of grain movement, particle entrainment by current, sediment loads, types of transport by fluid flows “water, wind, glacial ice” and their characteristic deposits. 13. What are the types of sediment gravity flows and their characteristic deposits? 14. Discuss the sedimentary structures; their types, genesis, classification, and geological significance.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Theoretical lectures</u>

	The physical properties of sedimentary rocks, Sedimentary textures (form, sphericity, roundness, surface textures), Grain size (grain size scales, Classification of grain size, measuring grain size, Graphical and mathematical treatment of grain size data, Application and importance of grain size data), Fabric (grain orientation, grain packing, grain-to-grain relations, and porosity), Classifications of porosity, factors affecting porosity and permeability. [*12* hrs] Transportation and deposition of siliciclastic sediments, Fundamental of Fluid flow (Reynolds number, Froude number, laminar and turbulent flow), Transport by fluids (transporting agents and effects, types of grain movement, particle entrainment by current, sediment loads, types of transport by fluid flows "water, wind, glacial ice" and their characteristic deposits), Transport by sediment gravity flows (types of sediment gravity flows and their characteristic deposits). [*12* hrs] Sedimentary structures, the significance of sedimentary structures, Classification of sedimentary structures, Primary sedimentary structures (Inorganic), Primary organic sedimentary structures, Secondary sedimentary structures. [*12* hrs] Revision problem classes [3 hrs] Part B – Practical labs Mechanical analysis of pebble shapes, Mathematical calculation of roundness and sphericity. [12 hrs] Grain-size analysis. [12 hrs]. Paleocurrent analysis. [12 hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Extending students' perceptions of this science and its contents, which aid in the definition of basic concepts related to sedimentology, physical properties of sedimentary rocks, physical characteristics, and sedimentary processes (transportation and deposition). Explain and interpret concepts, theories, and observational findings or phenomena related to the initiation processes of sedimentary rocks as they relate to the student's knowledge emphasis. This will be accomplished through lectures, labs, and interactive tutorials, as well as various practical diagnostic methods for measuring and analytical activities that are of interest to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري

	Material Covered
Week 1	Physical properties of sedimentary rocks, Sedimentary textures: form, sphericity, roundness, and surface textures.
Week 2	Grain size, grain size scales and classification, measuring grain size, graphical and mathematical
Week 3	Treatment of grain size data, application and importance of grain size data.
Week 4	Fabric: grain orientation, grain packing, grain-to-grain relations, and porosity.
Week 5	Transportation and deposition of siliciclastic sediment, Fundamental of Fluid flow
Week 6	Transporting agents and effects, types of grain movement, particle entrainment by current, sediment loads
Week 7	Transport by fluids flow “water, wind, and glacial ice.
Week 8	Transport by sediment gravity flows.
Week 9	Sedimentary structures, Introduction, the significance of sedimentary structures.
Week 10	Classification of sedimentary structures.
Week 11	Primary sedimentary structures (Inorganic).
Week 12	Primary sedimentary structures (Inorganic).
Week 13	Primary sedimentary structures (Organic).
Week 14	The importance of organic sedimentary structures (trace fossils).
Week 15	Secondary sedimentary structures.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Mechanical analysis of pebble shapes, (Introduction).
Week 2	Lab 2: Measuring the grain size of pebbles Using Vernia.
Week 3	Lab 3: Determine pebble shape using zing diagram (Exercise 1).
Week 4	Lab 4: Determine pebble shape using Sneed and Folk diagram (Exercise 2).
Week 5	Lab 5: Calculate mathematical roundness and sphericity (Exercise 3).
Week 6	Lab 6: Grain-size analysis of sand and sandstone (introduction).
Week 7	Lab 7: Sieve analysis of sand and sandstone in lab. (Exercise 1).
Week 8	Lab 8: Sieve analysis of sandstone (Exercise 2).
Week 9	Lab9: Sieve analysis of sandstone (Exercise 3).
Week10	Lab 10: Paleocurrent analysis (Introduction), (Exercise 1).
Week 11	Lab 11: Paleocurrent analysis (Exercise 2).
Week 12	Lab 12: Paleocurrent analysis (Exercise 2).

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Boggs, S. Jr. (2006).** Principle of Sedimentology and Stratigraphy, 4th Edition. Pearson Prentice Hall, Upper Saddle River, New Jersey, 662p. **Nichols, G. (2009)** Sedimentology and stratigraphy, 2nd edn. Blackwell Publ. Co., London, UK, 419p.	Yes Yes
Recommended Texts	**Reineck H.E., Singh, I.B. (1980)** Depositional sedimentary environments. Springer, Berlin, 549p. **Pettijohn, F. J. (1975)** Sedimentary Rocks, 3rd edn.: Harper and Row, New York, NY, pp 472 **Friedman and Johnson, (1980). Exercises in Sedimentology. pp. 54-75**	Yes Yes yes
Websites	https://www.youtube.com/watch?v=x6NVqxs1MJo https://www.youtube.com/watch?v=mMu3TW2lkIw&list=PL-pYB1SECj6KLVInuUMXy3azCCXbCoO62	

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	**Petrology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-23011**				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level		UGII	**Semester of Delivery**		3
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Sahar A. Qasim		**e-mail**	saharqasim59@gmail.com	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Safwan Fathi Al-Lhaebi		**e-mail**	safwanfathi@uomosul.edu.iq	
Peer Reviewer Name		Mohammed A. Suliman	**e-mail**	masuliman@uomosul.edu.iq	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Crystallography Mineralogy	**Semester**	1 2
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. The student gains knowledge and comprehension of the earth's crust and its covers. 2. The students will be able to describe the diversity of rock types based on observation form and hand specimen. 3. The students will be able to interpret the geological history of different rock types based on minerals assemblage, and textures using hand samples. 4. The students will be able to identify different types of igneous, sedimentary and metamorphic rocks and their features. 5. The students will be able to classify different rock types. 6. The students will be able to designate the different igneous, sedimentary and metamorphic characteristics based on minerals grain size, shape, origin, and texture. 7. The students will be able to describe their different occurrence processes and their field exposures.
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. What are the Principal subdivisions of the earth's interior? 2. What is the relationship between the three types of rocks in a rock cycle? 3. Defining igneous rocks and defining the types of igneous rock classifications. 4. Discuss the Bowen 's reaction series and description of the most common rocks. 5. Introduction and definition of metamorphic rocks and metamorphic factors. 6. Identify the Types of Metamorphism. 7. Types of Metamorphic facies. 8. Textures of metamorphic rocks. 9. What are advantages of sedimentary rocks and General classification of sedimentary rocks 10. Identify the Clastic rocks/ Sandstones, Conglomerate and Shale. 11. Identify the Chemical –Biochemical Rocks/ Carbonate rocks, Evaporate rocks. 12. Discuss the Other Chemical –Biochemical Rocks/ chert rocks, phosphorites, organic rocks ,others.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures The Principal Subdivisions of the Earth's Interior, Types of rocks, rock cycle, Igneous rocks, Classifications of igneous rocks, Chemical Composition of Igneous Rocks, Chemical Effect on the Mineral Composition, Mineralogical classifications, Grain Size and Occurrence, Discuss the Bowen 's reaction series and description of the most common rocks. [*12* hrs] Metamorphism, Factors Controlling Metamorphism, Types of Metamorphism, Grade of Metamorphism, Metamorphic Zones, Mineral assemblage, Metamorphic facies. [*12* hrs] Advantages of sedimentary rocks, General classification of sedimentary rocks, Clastic rocks/ Sandstones, Conglomerate and shale, Chemical–Biochemical Rocks/ Carbonate

	rocks, Evaporites rocks, Other Chemical–Biochemical Rocks/ chert rocks, phosphorites, organic rocks ,others. [*12* hrs] Revision problem classes [3 hrs] <u>Part B – Practical labs</u> Igneous Rocks (Introduction), Acidic Igneous Rocks, Intermediate Igneous Rocks, Basic Igneous Rocks, Ultrabasic Igneous Rocks. [12 hrs] Metamorphic Rocks (Introduction), Metamorphic Rocks (Non-foliated rocks), Metamorphic Rocks (Foliated rocks). [12 hrs]. Clastic rocks/Sandstones, Clastic rocks/Conglomerate and shale, Chemical–Biochemical Rocks/Carbonate rocks, Chemical –Biochemical Rocks/Evaporites rocks, Other Chemical –Biochemical Rocks/ chert rocks, phosphorites, organic rocks, others. [12 hrs].

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Extending students' perceptions of this science and its contents, which aid in the definition of basic concepts related to Petrology evolution, characteristics, and processes. Explain and interpret concepts, theories, and observational findings or phenomena related to the initiation processes of igneous, metamorphic, and sedimentary rocks as they relate to the student's knowledge emphasis. This will be accomplished through lectures, labs, and interactive tutorials, as well as various practical diagnostic methods for hand specimens and sampling activities that are of interest to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
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 #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Principal subdivisions of the Earth's interior, The Rock Cycle.
Week 2	Igneous Rocks, Classification and Nomenclature of Igneous Rocks; Chemical Composition.
Week 3	Chemical Effect on the Mineral Composition.
Week 4	Mineralogical classifications, Grain Size and Occurrence.
Week 5	Bowen 's reaction series and description of the most common rocks.
Week 6	Metamorphism, Factors Controlling Metamorphism.
Week 7	Types of Metamorphism, Contact Metamorphism, Regional Metamorphism, Dynamic Metamorphism.
Week 8	Grade of Metamorphism, Metamorphic Zones, Mineral assemblage .
Week 9	Metamorphic facies, Regional metamorphic facies.
Week 10	Metamorphic facies, Contact metamorphic facies.
Week 11	Advantages of sedimentary rocks.
Week 12	General classification of sedimentary rocks, Clastic rocks/ Sandstones.
Week 13	Clastic rocks/ Conglomerate and Shale.
Week 14	Chemical–Biochemical Rocks/ Carbonate rocks, Evaporites rocks.
Week 15	Other Chemical–Biochemical Rocks/ chert rocks, Phosphorites, Organic rocks ,others.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Igneous Rocks (Introduction).
Week 2	Lab 2: Acidic Igneous Rocks.
Week 3	Lab 3: Intermediate Igneous Rocks.
Week 4	Lab 4: Basic Igneous Rocks, Ultrabasic Igneous Rocks.
Week 5	Lab 5: Metamorphic Rocks (Introduction).
Week 6	Lab 6: Metamorphic Rocks (Non-foliated rocks).
Week 7	Lab 7: Metamorphic Rocks (Foliated rocks).
Week 8	Lab 8: Metamorphic Rocks (Foliated rocks).
Week 9	Lab9: Clastic rocks/Sandstones.
Week10	Lab 10: Clastic rocks/Conglomerate and Shale.
Week 11	Lab 11: Chemical–Biochemical Rocks/Carbonate rocks, Evaporites rocks.
Week 12	Lab 12: Other Chemical –Biochemical Rocks/ chert rocks, phosphorites, organic rocks, others.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Best, M.G. (2003):** Igneous Metamorphic Petrology. Blackwell Science Ltd, 715. **Carmichael, I.S.E., Turner, F.J. and Verhoogen, J. (1974):** Igneous petrology. McGraw Hill Company, New York. **Bogges (2006):** Sedimentology and Stratigraphy.	Yes Yes
Recommended Texts	**Bowen, N.L. (1928):** The evolution of igneous rocks, Princeton University Press, Princeton, N.L, 332. **Gill, R. (2010):** Igneous Rocks and Processes. WILEY-BLACKWELL, UK, 428. **Nichols (2009):** Sedimentology and Stratigraphy	Yes No
Websites	https://opengeology.org/petrology/01-introduction-to-petrology/ https://link.springer.com/journal/11495 https://academic.oup.com/petrology	

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	**Metamorphic petrology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-24016**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		UGII	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Omar Saif Aldeen Dawood Al-Taweel		**e-mail**	omarsaif@uomosul.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		MS.C.
Module Tutor	Zahraa Jarjes Aljubory		**e-mail**	Zahraa1981@uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Optical Mineralogy	**Semester**	3
Co-requisites module	Petrology	**Semester**	4

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Clarification of how the metamorphic rocks can make significant contributions to a useful in geosciences. 2. Identify the rocks which are useful in industry. 3. This course deals with the basic concept of the most important metamorphic factors and there effect aspects of this modular. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand the impact of these rocks in geological averment, . 6. To perform different applications in mineralogy.
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. List with description, the metamorphic rock and there important. 2. Define the various terms of rocks . 3. Definition of metamorphic, and factors of metamorphisim that importance in geoscience. 4. Summarize what is meant by external and internal texture and structures of Study rocks. 5.Define the main effect of metamorphic rocks on industry , 6. Identify the averment of study rocks. 7. Terminology.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures Introduction , Metamorphism Factors of metamorphism Geothermal gradient Prograde metamorphism Retrograde metamorphism 18hrs Type of metamorphism Local metamorphism Regional metamorphism Grade of metamorphism Index minerals Isograds 18hrs, Phase rule Univariant system Bivariant System Mineral assemblage Types of metamorphism reactions 18hrs Triangular diagrams Metamorphic facies 12hrs Part B – Practical labs Introduction of Metamorphic rocks METAMORPHIC MINERALS. 3hrs CONTACT (THERMAL) METAMORPHISM. Description of the rock slides for contact metamorphic rocks First Quiz 6hrs DYNAMIC METAMORPHISM Description of the rock slides for dynamic metamorphic rocks 6hrs REGIONAL METAMORPHISM (BARROVIAN-TYPE) Description of the rock slides

	for regional metamorphic rocks Second Quiz 12hrs Trigonometric forms of the chemical classification of rocks 6hrs ACF Digram for Escolaa 3hrs AFM Digram for Thombson Third Quiz 6hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The student will understand the physical factors controlling the transformation and classifying them chemically and histologically and by types of practical diagnostic methods for metamorphic rocks sampling activities that are interesting to the students. The study of metamorphic rocks Lab for (3) hrs/week, It specializes in studying the metamorphic rocks and classifying them chemically and histologically, the conditions of formation of these rocks from an environmental point of view, and the physical factors controlling the transformation.

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

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Metamorphism
Week 2	Factors of metamorphism
Week 3	Geothermal gradient
Week 4	Retrograde metamorphism
Week 5	Prograde metamorphism
Week 6	Type of metamorphism Local metamorphism Regional metamorphism
Week 7	Index minerals
Week 8	Grade of metamorphism Isograds
Week 9	Phase rule
Week 10	Univariant system
Week 11	Bivariant System
Week 12	Mineral assemblage
Week 13	Types of metamorphism reactions
Week 14	Triangular diagrams

Week 15	Metamorphic facies

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction of Metamorphic rocks METAMORPHIC MINERALS.
Week 2	Lab 2: CONTACT (THERMAL) METAMORPHISM. .
Week 3	Lab 3: Description of the rock slides for contact metamorphic rocks .
Week 4	Lab 4: DYNAMIC METAMORPHISM
Week 5	Lab 5: Description of the rock slides for dynamic metamorphic rocks .
Week 6	Lab 6: REGIONAL METAMORPHISM (BARROVIAN-TYPE) .
Week 7	Lab 7: Description of the slate & Phyllite rock slides.
Week 8	Lab 8: Description of the schist rock slides .
Week 9	Lab9: Description of the gneiss rock slides.
Week10	Lab 10: Description of the eglogite rock slides.
Week 11	Lab 11: ACF Digram for Escolaa.
Week 12	Lab 12: AFM Digram for Thombson

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	علم الصخور المتحولة Petrogenesis of Metamorphic Rocks Kurt Bucher **Metamorphic Rocks** Rebecca Pettiford	Yes
Recommended Texts	**Jassim, S. Z. and Goff, J. C., 2006,** Geology of Iraq, Published by Dolin, Prague and Moravian Museum, Brno, Czech Republic.	Yes
Websites	https://www.geokniga.org/bookfiles/geokniga-petrogenesis-metamorphic-rocks.pdf	

	https://raregeologybooks.files.wordpress.com/2014/10/petrogenesis-of-metamorphic-rocks-by-k-bucher-and-m-frey.pdf

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	**Igneous Petrology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-23013**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		UGII	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Mohammed A. Suliman		e-mail	masuliman@uomosul.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		MSc
Module Tutor			**e-mail**		
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Crystallography Mineralogy Petrology Optical Mineralogy	**Semester**	1 2 3 3
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. The student will gain knowledge about the three Principal Subdivisions of the Earth's interior: the crust, mantle, and core. 2. The student will be studying the Forms and Structures of Intrusive Rocks such as Dykes, Sills, Batholiths, and Ophiolite Complexes. 3. Identifying igneous rock classifications, where the student is acquainted with chemical, mineral, and texture classifications. 4. Studying the various textures of igneous rocks, such as phaneritic, aphanitic, porphyritic, graphic, myrmekitic, and others.. 5. Learn about the history of magma crystallization and how minerals crystallize by studying mono, binary, and ternary systems and applying the phase rule to them. 6. Petrographic study of the acidic, intermediate, basic, and ultrabasic igneous rocks under a polarizing microscope.
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. What are the Principal subdivisions of the earth's interior? 2. Identify the Forms and Structures of Intrusive Rocks. 3. Defining the types of igneous rock classifications. 4. Magmatic Differentiation. 5. Definition of Partial Melting 6. Discuss the Bowen 's reaction series. 7. Explain the Petrogenesis 8. Discuss the Magma Generation. 9. Tectonic Setting and Conclusions of Basaltic and Granitic Rocks. 10. Physical Chemistry. 11. Defining Phase Rule. 12. Phase diagram
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures Introduction, The Principal Subdivisions of the Earth's Interior, crust, mantle, core, Pyrolite Model, Forms and Structures of Intrusive Rocks such as Dykes, Sills, Batholiths, and Ophiolite Complexes, Tectonite peridotite rocks, Cumulated Rocks, Classification of Igneous Rocks, Chemical Classification, Chemical Effect on the Mineral Composition, Mineralogical classifications, textural classification. [*10* hrs] Magmatic Differentiation, Partial Melting, Bowen's Reaction Series, Crystal fractionation, Petrogenesis, Magma Generation, Mechanism of melting, Generation of Basaltic Magma, Generation of Granitic Magma, . [*8* hrs] Tectonic Setting and Conclusions of Basaltic and Granitic Rocks, Plate Tectonics, Plate boundaries or margins, Tectonic Environments, Oceanic Igneous Rocks. [*10* hrs]

	Physical Chemistry and Physical Properties of the Synthetic Magmas, Phase Rule, Phase diagram, One Component (Unary) Systems, Two Components (Binary) Systems, Three Components (Ternary) Systems, Four Components (Quaternary) Systems . [8 hrs] Revision problem classes [3 hrs] <u>Part B – Practical labs</u> Introduction of Igneous Rocks, Diagnostic features of igneous minerals by the microscope, Textures of Igneous Rocks, Classification of Igneous Rocks, Acidic Igneous, Types of Acidic Igneous Rocks. [18 hrs] Intermediate Igneous Rocks, Types of Intermediate Igneous Rocks, Basic Igneous Rocks, Types of Basic Igneous Rocks, Ultrabasic Igneous Rocks, Types of Ultrabasic Igneous Rocks. [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expanding students' perceptions about this science and its contents it includes that help in stratigraphic, paleoecologic, and paleoclimatic analysis. In addition to the use of different microscopes in distinguishing the types of microfossils through observations of the external and internal structures and their diagnosis. This will be achieved through lectures, labs, and interactive tutorials and by types of practical diagnostic methods for microfossils and 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	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Principal subdivisions of the Earth's interior : crust, and the upper mantel.
Week 2	Diagnostic physical and petrological evidences, transition zone, lower mantle, and the core.
Week 3	Forms and structures of intrusive igneous rocks, introduction, basic intrusion into continental crust, and ophiolite complexes.
Week 4	Classification of igneous rocks: Introduction, chemical classification, and the effects of chemical composition of igneous rocks on its mineralogy.
Week 5	Mineralogical classification and textural classification.
Week 6	Magmatic differentiation, Partial melting, Bowen's Reaction Series crystal fractionation.
Week 7	Petrogenesis, Magma Generation, Mechanism of melting, Generation of Basaltic Magma, Generation of Granitic Magma.
Week 8	Bowen's Reaction Series crystal fractionation, Petrogenesis, Magma Generation,
Week 9	Tectonic Setting and Conclusions of Basaltic and Granitic Rocks, Plate Tectonics, Plate boundaries or margins.
Week 10	Tectonic Environments, Oceanic Igneous Rocks..
Week 11	Physical Chemistry and Physical Properties of the Synthetic Magmas, Phase Rule, Phase diagram,.
Week 12	One Component (Unary) Systems.
Week 13	Two Components (Binary) Systems.
Week 14	Three Components (Ternary) Systems.
Week 15	Four Components (Quaternary) Systems..

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Introduction of Igneous Rocks.
Week 2	Lab 2: Diagnostic features of igneous minerals by the microscope.
Week 3	Lab 3: Textures of Igneous Rocks and their minerals.
Week 4	Lab 4: Classification of Igneous Rocks.
Week 5	Lab 5: Acidic Igneous.
Week 6	Lab 6: Types of Acidic Igneous Rocks.
Week 7	Lab 7: Intermediate Igneous Rocks.
Week 8	Lab 8:. Types of Intermediate Igneous Rocks.
Week 9	Lab9: Basic Igneous Rocks.
Week10	Lab 10: Types of Basic Igneous Rocks.
Week 11	Lab 11: Ultrabasic Igneous Rocks.
Week 12	Lab 12: Types of Ultrabasic Igneous Rocks.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Best, M .G. (1982):** Igneous and Metamorphic Petrology. W.H. Freeman and company, New York, 630. **Best, M.G. (2003):** Igneous Metamorphic Petrology. Blackwell Science Ltd, 715. **Boulder, F. and Coleman, R.G. (1981):** Cross section through the peridotite in the semail ophiolite, South eastern Oman mountains. J. Geophys Res., 86: 93-2573. **Carmichael, I.S.E., Turner, F.J. and Verhoogen, J. (1974):** Igneous petrology. McGraw Hill Company, New York.	Yes Yes
Recommended Texts	**Gill, R. (2010):** Igneous Rocks and Processes. WILEY-BLACKWELL, UK, 428. **Klein, C. and Harlbut, J.C.S. (1993):** Manual of Mineralogy. John Wiley and Sons, New York: 681. **Wilson, M. (2007):** Igneous Petrogenesis. Chapman and Hall, Springer, 466.	Yes No
Websites	https://geologyscience.com/geology-branches/petrology/igneous-petrology/ https://opengeology.org/petrology/02-igneous-rocks/ https://www.britannica.com/science/igneous-rock/Classification-of-volcanic-and-hypabyssal-rocks#ref80226	

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

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

MODULE DESCRIPTION FORM

Module Information					
Module Title	**Micropaleontology I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-24014**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		2	**Semester of Delivery**		4
Administering Department		Type Dept. Code	**College**	Type College Code	
Module Leader	Abdullah sultan shihab		**e-mail**	abdhididi65@uomosul.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Maha Abdule Hameed AL-Hasson		**e-mail**	drmahamustafa@uomosul.edu.iq	
Peer Reviewer Name		Alaa Mhmood Saad	**e-mail**	alaawazan@uomosul.edu.iq	
Scientific Committee Approval Date		02/06/2023	**Version Number**		1.0

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1.The general concept of fossils& branches of paleontology 2.identification of the living animal foraminifera. 3-learn about the life cycle and reproduction of foraminifera. 4-Describe the general appearance of the foraminifera shell shape. 5-Taxonmic study of foraminifera. 6-Astudy of geological history ,paleoenvironment and application of the foraminifera. 7-Modes of life of Microorganisms. 8-Organic Microfossils,Diefinition,types, applications. 9- spores&pollengrains(definition ,life cycle,life cycle, affinity, production, morphological characters,wall composition,classification,Distribution,Evolutionary trends & Historical geology). 10-Acritarch group: morphology,affinity,classification,historical geology,ecology. 11-Chitinozoa group: morphology, ,life cycle, affinity,classification,historical geology,ecology. 12-Dionflagellatesgroup: morphology, ,life cycle affinity,classification,historical geology,ecology.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1-Enumerate of kingdom of life. 2-Explain the life cyclic of the foraminifera. 3-define terms procayotic, genus, species…….end. 4-Determine the geological age by the Globorotalia*, Globigerna,*……end. 5-Discuss the geological application of foraminifera. 6-Mention the main point in describing the shell the foraminifera. 7-Modes of life of Microorganisms. 8- define the Organic Microfossils. 9- definition ,affinity, production, morphological characters,wall composition,classification,Distribution,Evolutionary trends & Historical geology of spores&pollengrains . 10- Whats the morphology characters ,affinity,classification,historical geology,ecology of Acritarch group. 11- - Whats the morphology characters ,affinity,classification,historical geology,ecology of Chitinozoa group. 12- Whats the morphological characters ,affinity,classification,historical geology,ecology of Dinoflagellates group. ……
Indicative Contents	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction,Micropaleontology,scientific terms,Binomial Nomencluture,the kingdom of live, living foraminifera ,life cycle of foraminifera,the description the test of

	foraminifera,classification ,(10hrs). Geological history foraminifera, Ecology of foraminifera,Application of foraminifera. 8-Organic Microfossils,Diefinition,types, applications. 9- spores&pollengrains(definition ,life cycle,life cycle, affinity, production, morphological characters,wall composition,classification,Distribution,Evolutionary trends & Historical geology).(8hrs) 10-Acritarch group: morphology,affinity,classification,historical geology,ecology 11-Chitinozoa group: morphology, ,life cycle, affinity,classification,historical geology,ecology.(10hrs) 12-Dionflagellatesgroup: morphology, ,life cycle affinity,classification,historical geology,ecology.(8hrs) Indicative content includes the following. Revision problem classes(3hrs) Part B – Practical labs Composition and microstructure of the wall,chabers test shape and chamber arrangement,aperture,suture line,ornamentation,periphery of test,umbilical characters.(18hrs). Spores &pollen grains (,types,morphology,symmetry, wall types,laesurae types,ornamentation,classification) Acritarchs (,types,morphology, y, wall types,pylome types,classification) Chitinozoa (morphology, , wall types,basal margin structure types,classification) (81hrs)

Learning and Teaching Strategies	
Strategies	Expanding students' perceptions about this science and its contents it includes that help in Description, Classification, History geological, paleoecologic, and Application. In addition to the use of different microscopes in distinguishing the types of microfossils through observations of the shape of test.

Student Workload (SWL)			
Structured SWL (h/sem)	78	**Structured SWL (h/w)**	5.2
Unstructured SWL (h/sem)ل	47	**Unstructured SWL (h/w)**	3.1
Total SWL (h/sem)	**125**		

Module Evaluation

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Foraminifera, scientific terms,general terms,the kingdom of live,group microfossils.
Week 2	Living foraminifera,general organization life cyclic of foraminifera.
Week 3	Description of foraminifera.
Week 4,5	Classification of foraminifera.
Week 6	Geological history foraminifera,ecology.
Week 7	Application of foraminifera.
Week 8	Organic microfossils:Introduction definition,types,applications
Week 9	Spores & pollen grains morphology,life cycl(reproduction) ,morphology.
Week10	Spores&pollen evolution, classification& historical geology.
Week 11	Chitinozoans morphology,life cycl(reproduction) ,morphology, evolution, classification& historical geology.
Week 12	Acritarchs morphology,life cycl(reproduction) ,morphology.
Week 13	Acritarchs, evolution, classification& historical geology.
Week 14	Dinoflagellates morphology,life cycl(reproduction) ,morphology.
Week 15	**Dinoflagellates evolution, classification& historical geology.,**

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: composition and microstructure of the wall.
Week 2	Lab 2: chambers shape and chamber arrangement.
Week 3	Lab 3: aperture.
Week 4	Lab 4: suture line.
Week 5	Lab 5: periphery of test, : ornamentation and umbilical characters.
Week 6	Lab 6 spores :morphological characters(shapes,wall,aperture,ornamentation)
Week 7	Lab 7: pollen grains:morphological characters(shapes,wall,aperture,ornamentation)
Week 8	Lab 8:
Week 9	Lab9:
Week10	Lab 10: spores&pollen classification
Week 11	Lab 11: Acritarchs Group(shapes,wall,aperture,ornamentation)
Week 12	Lab 12: Chtinozoans(shapes,wall,aperture,ornamentation)

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	**Armstrong, H. and Brasier, M. (2005**). Microfossils Black well publishing , p. 296.**.** **Abawie et.al.,(1992),Micropaleontology.**	Yes Yes
Recommended Texts	**Haq, B.U., Boersma, A., (1978)**. Introduction to marine micropaleontology. micropaleontology, Elsevier, New York, 376 p. Al-haq ,Bilal&Boersma,Anne(1998):Introduction to marine Micropaleontology.Elsevier,AMSTERDAM,SINGAPORE.	Yes
Websites	https://www.youtube.com/watch?v=GPD6RXllrXQ&ab_channel=GEOGIRL	

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Invertebrate Paleontology II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**GEO-24117**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Omar Ahmed Al-Badrani		**e-mail**	omarbadrani@uomosul.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Mahfod Abdulla Ali Rana Abduelah		**e-mail**	omarbadrani@uomosul.edu.iq rana.abdulelah@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	23/04/2024		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The study aims to introduce students in the first stage to the science of Invertebrate Paleontology and all its branches and specializations. This is done by giving preliminary introductory lectures in a simplified and in-depth manner to all the disciplines that the student will learn in the coming stages, so that he will be prepared later to delve deeper into those disciplines when he learns them in the future. Students will be taught The Trilobites Echinoids and Graptolites. تهدف الدراسة إلى تعريف الطلبة في المرحلة الأولى بعلم الحفريات اللافقارية بكافة فروعها وتخصصاتها .ويتم ذلك من خلال إعطاء محاضرات تمهيدية تمهيدية بشكل مبسط ومعمق لجميع التخصصات التي سيتعلمها الطالب في المراحل القادمة، حتى يكون مستعداً لاحقاً للتعمق في تلك التخصصات عندما يتعلمها مستقبلاً . .سيتم تعليم الطلاب ثلاثية الفصوص Echinoids و Graptolites.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- The study of Invertebrate Paleontology and its connection with other groups. 2- The study of Trilobites . 3- The study of Echinoids. 4- The study of Graptolites. دراسة المتحجرات اللافقرية وارتباطها بباقي المتحجرات اللافقرية والمقارنة بينها.
Indicative Contents المحتويات الإرشادية	Invertebrate - An Overview, Trilobites Shell , Trilobites Terminology , Terminology – Cephalon , Terminology – Thorax and Pygidium , Trilobites Growth Stages , Trilobites Classification , Geological History and Distribution of Trilobites , Echinoids - General Morphology , Orientation of Echinoids , Major differences , between Regular and Irregular echinoids , Echinoids Terminology , Echinoids Classification , Echinoids Geological History , Graptolites

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teach students how to distinguish Focusing on searching through the layers for fossils and their effects because they have a role in determining the works of those rock layers. Trilobites, Echinoids and Graptolites. تعليم الطلاب كيفية التمييز مع التركيز على البحث في الطبقات عن الحفريات وآثارها لما لها من دور

	ثلاثية الفصوص، الشينويدات والجرابتوليت .في تحديد عمل تلك الطبقات الصخرية.

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..3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.3
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 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	Invertebrate - An Overview.

Week 2	Trilobites Shell.
Week 3	Trilobites Terminology .
Week 4	Terminology - Cephalon.
Week 5	Terminology – Thorax and Pygidium.
Week 6	Trilobites Growth Stages.
Week 7	Trilobites Classification.
Week 8	Geological History and Distribution of Trilobites.
Week 9	Echinoids - General Morphology.
Week 10	Orientation of Echinoids.
Week 11	Major differences between Regular and Irregular echinoids.
Week 12	Echinoids Terminology.
Week 13	Echinoids Classification.
Week 14	Echinoids Geological History.
Week 15	Graptolites.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Lab 1:** laboratory 1
Week 2	**Lab 2:** laboratory2
Week 3	**Lab 3:** laboratory3
Week 4	**Lab 4:** laboratory4
Week 5	**Lab 5:** laboratory5
Week 6	**Lab 6:** laboratory6
Week 7	**Lab 7:** laboratory7
Week 8	**Lab 8:** laboratory8
Week 9	**Lab9:** laboratory9
Week10	**Lab 10:** laboratory10
Week 11	**Lab 11:** laboratory11

Week 12	**Lab 12:** Summary.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Reed Wicander, James S. Monroe , 2010 Historical Geology	Yes Yes
Recommended Texts		Yes No
Websites		

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Sedimentary Petrology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-24015**				
ECTS Credits	**5.00**				
SWL (hr/sem)	**125**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rafee Ibrahim Al-Humidi		**e-mail**	Rafeegeo66@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Zaid Abdulwahhab Malak		**e-mail**	zaidmalak@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The aim of studying this course is to introduce the student to the various types of sediments and sedimentary rocks that exist in nature and to show the importance of studying sedimentary rocks and sediments from a purely scientific and applied perspective.
Module Learning Outcomes	Study of the different types of sedimentary rocks such as: conglomerate, breccia, sandstone, mudstone, limestone, dolomite, chert, iron-rich rocks, phosphate rocks, and evaporite rocks. diagenesis processes in clastic and carbonate rocks.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Theoretical lectures Introduction, Particle composition . Major Minerals, Quartz, Feldspars, Coarse Mica, Clay minerals, Heavy minerals, Rock fragments, Mineral Cements, Matrix Minerals, sandstones maturity, Classification of sandstones, Classification of epiclastic sandstone, Petrography and chemistry of sandstones, Quartz arenites, Feldspathic arenites, Lithic arenites. Other sandstones. [*10* hrs] Gravels, Conglomerates, and Breccias, Composition of framework clasts, Composition of matrix and cements, Sedimentary structures in conglomerates, classification of conglomerates, General statement, Classification by relative clast stability, Classification by clast lithology, Classification by clast size, extraformational (terrigenous gravel) conglomerates and breccias, Orthoconglomerates, Paraconglomerates (Conglomeratic Mudstone), Intraformational Conglomerates and Breccias . [*8* hrs] Shale (Mudstone), composition, chemical composition, classification, origin of shale, diagenesis of siliciclastic sedimentary rocks, eogenesis, mesogenesis, telogenesis. [*10* hrs]. Siliceous sedimentary rocks (cherts) , Mineralogy and texture, Principal kinds of cherts, Bedded and nodular chert, Deposition of chert , Precipitation of chert from seawater, Biogenic removal of silica, Nonbiogenic cherts, Replacement chert. Carbonate sedimentary rocks, Limestone, Introduction, Mineralogy Major components of limestones, Identification of carbonate minerals, Noncarbonate components Carbonate grains, Peloids, coated grains, Lithoclasts, Skeletal grains (bioclasts), Microcrystalline carbonate (lime mud), Sparry calcite Classification of carbonate rocks, Folk's classification (1962), Dunham's classification (1962).\ Nonmarine carbonates, Lacustrine carbonates, Carbonates in rivers, streams, and springs, Caliche (calcrete) carbonates, Dolomites, Introduction, Mineralogy of dolomites, Dolomite textures, Origin of dolomite. Diagenesis of carbonate rocks, Introduction, Biogenic Alteration, Cementation, Dissolution, Neomorphism, Replacement Evaporites, Introduction, Gypsum and Anhydrite, Nodular anhydrites, Laminated anhydrites, Massive anhydrite, Halite. Origin of Evaporite Deposits, Depositional Models for Evaporites.

	Phosphates, Introduction, Precipitation of Phosphates Part B – Practical labs -Carbonates rocks petrographical components -Carbonate classification - Carbonate diagenesis -Sandstones rocks petrographical components - Quartz types -Textural components -Sandstones classification - Sandstones diagenesis -evaporites petrography . [18 hrs

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expand students' perceptions about this science and its contents that help in understanding the types of sedimentary rocks (clastic and carbonate), and their relationship in facies analysis, inferring the ancient environment, and determining the ancient climate. This is achieved through theoretical lectures, practical laboratories, and the use of interactive and video educational programs. Different microscopes are also used to distinguish the types of minerals that make up different rocks.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري	
	Material Covered
Week 1	Introduction, Particle composition . Major Minerals, Quartz, Feldspars, Coarse Mica, Clay minerals, Heavy minerals, Rock fragments.
Week 2	Mineral Cements, Matrix Minerals, sandstones maturity, Classification of sandstones, Classification of epiclastic sandstone, Petrography and chemistry of sandstones
Week 3	Quartz arenites, Feldspathic arenites, Lithic arenites. Other sandstones.
Week 4	Gravels, Conglomerates, and Breccias, Composition of framework clasts, Composition of matrix and cements, Sedimentary structures in conglomerates, classification of conglomerates, General statement, Classification by relative clast stability, Classification by clast lithology
Week 5	Classification by clast size, extraformational (terrigenous gravel) conglomerates and breccias, Orthoconglomerates, Paraconglomerates (Conglomeratic Mudstone), Intraformational Conglomerates and Breccias
Week 6	Shale (Mudstone), composition, chemical composition, classification, origin of shale, diagenesis of siliciclastic sedimentary rocks, eogenesis, mesogenesis, telogenesis.
Week 7	Siliceous sedimentary rocks (cherts) , Mineralogy and texture, Principal kinds of cherts, Bedded and nodular chert, Deposition of chert , Precipitation of chert from seawater, Biogenic removal of silica, Nonbiogenic cherts, Replacement chert.
Week 8	**Carbonate sedimentary rocks, Limestone，Introduction, Mineralogy**
Week 9	**Major components of limestones, Identification of carbonate minerals, Noncarbonate components**
Week 10	**Carbonate grains, Peloids, coated grains, Lithoclasts,** **Skeletal grains (bioclasts), Microcrystalline carbonate (lime mud), Sparry calcite**
Week 11	**Classification of carbonate rocks, Folk's classification (1962), Dunham's classification (1962).** **Nonmarine carbonates, Lacustrine carbonates, Carbonates in rivers, streams, and springs, Caliche**

	(calcrete) carbonates,
Week 12	**Dolomites, Introduction, Mineralogy of dolomites, Dolomite textures, Origin of dolomite.**
Week 13	**Diagenesis of carbonate rocks, Introduction, Biogenic Alteration, Cementation, Dissolution, Neomorphism, Replacement**
Week 14	**Evaporites, Introduction, Gypsum and Anhydrite, Nodular anhydrites, Laminated anhydrites, Massive anhydrite, Halite.** **Origin of Evaporite Deposits, Depositional Models for Evaporites.**
Week 15	**Phosphates, Introduction, Precipitation of Phosphates**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: -Carbonates rocks petrographical components
Week 2	Lab 2: -Carbonate classification
Week 3	Lab 3: - Carbonate diagenesis
Week 4	Lab 4: -Sandstones rocks petrographical components
Week 5	Lab 5: - Quartz types
Week 6	Lab 6: -Textural components
Week 7	Lab 7: -Sandstones classification
Week 8	Lab 8:. - Sandstones diagenesis
Week 9	Lab9: -evaporites petrography
Week10	Lab 10:
Week 11	Lab 11:
Week 12	Lab 12:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Boggs, S. Jr. 2009. PETROLOGY OF SEDIMENTARY ROCKS, (2nd ed.), Cambridge University Press, New York, 612P.	Yes
	Boggs, S. Jr. 2006. Principles of Sedimentology and Stratigraphy, (4th ed.), Pearson Prentice-Hall, 662.P.	Yes

Recommended Texts	Pettijohn, F. J., 1975, Sedimentary Rocks, 3rd ed.: Harper and Row, New York, NY.	Yes
Websites	https://www.youtube.com/watch?v=KuP7hdmysbE&list=PLpk11CHBpb6trkAEcO-ckg_YYM8vVL9rZ&ab_channel=GeoMind	

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

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

MODULE DESCRIPTION FORM

Module Information					
Module Title	**Stratigraphy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-35023**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Maha Abdule Hameed Al-Hasson		**e-mail**	drmahamustafa@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Abdullah Sultan shihab		**e-mail**	abdhadidi65@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module		**Semester**	
Co-requisites module	General Geology 2	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1-sratigraphy (definition,relation with sedimentology,principles&historical review) 2-Organization of stratigraphic column,Evolution of Stratigraphic classification Code of stratigraphic Nomenclature. 4-Types of formal stratigraphic unit,Lithostratigraphic units. 5- Biostratigraphic units,chronostratigraphic units,chronologic units. 6-magnetostratigraphic units ,other units& informal units. 7-Lithosomes,Biosomes,geometrical classification of Lithosomes. 8-Stratigraphic relationships among Lithosomes. 9-Types of Stratigraphic relationships among Lithosomes. 10-Principle of correlation, Introduction. 11- Correlation of lithostratigraphy. 12-Parastratigraphic Units, Marker bed. 13-Methods of rocks units correlation. 14-Biostratigraphic units. 15-Indification sedimentary Environments.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. List with description, methods of rocks units correlation. 2. Define the various terms marker bed with drawing them. 3. Definition of parastratigraphic units and drawing them. and mention importance in geoscience. 4.mention Summarize the continental of sedimentary. 5-Dicuss the marine environment with drawing them. 6-Define marker bed, Correlation, lagoonal env. Swampenv. 7-principles of stratigraphy ,definitions . 9-How organized the stratigraphic column&stratigraphic classification 10-define stratigraphic units , Lithostratigraphic units,Biostratigraphicm other formal&informal stratigraphic units. 11- define& sketch Lithosomes,Biosomes,Give geometrical classification of Lithosomes 12 Explain& sketch stratigraphic boundaries among lithosomes 13-Give differences between conformable& uncoformable relationships among Lithosomes.
Indicative Contents	Indicative content includes the following. Part A – Theoretical lectures Introduction, principle of correlation. Correlation of Stratigraphy, methods of rock correlation, biostratigraphy units, time Stratigraphy units, element and FACTORS, classification of sedimentary Environments, continental env. Terrestrial env., aquous env. Marine env. (18hrs).

	-sratigraphy (definition,relation with sedimentology,principles&historical review) ,Organization of stratigraphic column,Evolution of Stratigraphic classification Code of stratigraphic Nomenclature. Types of formal stratigraphic units(Lithostratigraphic units., Biostratigraphic units,chronostratigraphic units,chronologic units.,magnetostratigraphic units ,other units)& informal units. -Lithosomes,Biosomes,geometrical classification of Lithosomes. Stratigraphic relationships among Lithosomes.,Types of Stratigraphic relationships among Lithosomes(conformable:vertical&lateral),unconformable,compound relationships. Part B – Practical labs

Learning and Teaching Strategies

Strategies	Expanding students' perceptions about this science and its contents it includes that help in principle of correlation. Lithostratigraphic units, parastig. Units. Marker bed, methods of rocks units, sedimentary env.

Student Workload (SWL)

Structured SWL (h/sem) ا	63	**Structured SWL (h/w)** ا	4.2
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)** ا	4.1
Total SWL (h/sem)	**125**		

Module Evaluation

تقييم المادة الدراسية

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

	Material Covered
Week 1	-sratigraphy (definition,relation with sedimentology,principles&historical review)
Week 2	Organization of stratigraphic column
Week 3	Code of stratigraphic Nomenclature.
Week 4	. Types of formal stratigraphic unit,Lithostratigraphic units. Biostratigraphic units,chronostratigraphic units,chronologic units.
Week 5	6-magnetostratigraphic units ,other units& informal units(Parastratigraphic,cyclostratigraphic, paleoclimatic units relative&Absolute age determination..
Week 6	-Lithosomes,Biosomes,geometrical classification of Lithosomes. 8-Stratigraphic relationships among Lithosomes.
Week 7	Types of Stratigraphic relationships among Lithosomes.
Week 8	Conpound relation ships, Hiatus m unconformity ,Regional& Local unconformity.
Week 9	correlation, correlation of lith stratigraphicby marker bed. .
Week 10	Methods of rocks unitsby position in stratigraphic section .
Week 11	Biostratigraphic units.
Week 12	Classification of sedimentary env.
Week 13	Continental Env. Terrestrial env. Aquous env.
Week 14	Transitional env.
Week 15	Marine env.

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Stratigraphic,principles,Geologic Time Scale ,Stratigraphic symboles& types of stratigraphic scales.
Week 2	Lithostratigraphic correlation
Week 3	. Panel diagram(Fence)correlation
Week 4	. Compound type section & lithocorrelation among several sections in outcrops
Week 5	lithocorrelation among several sections in in wells(subsurface sections)
Week 6	. Determination of Biozones& range chart
Week 7	Lihofacies mapss
Week 8	Biofacies maps
Week 9	Stratigraphic maps
Week10	π *diagram*
Week 11	Reafal limestone resorvior layer &countoring maps from subsurface sections.
Week 12	Clastic/non-clastic ratio map&physical/chemical sediments ratio map.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Armstrong, H. and Brasier, M. (2005). Microfossils Black well publishing , p. 296. Boggs,Sam.,(2004):principles of Sedimentology & Stratigraphy.4edition.Mervvil publishing company, United States of America.	Yes Yes
Recommended Texts	Stratigraphy by Al-Omari et. el., 1992,.	Yes No
Websites	https://www.youtube.com/watch?v=6w_TJS5j01M&ab_channel=UNCarchaeology	

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Geochemistry**			**Module Delivery**	
Module Type	**C**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-3522**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		UGIII	**Semester of Delivery**		Five
Administering Department		Geology science	**College**	science	
Module Leader	Flyah Hassan Abbas		**e-mail**	flyahabas@uomosul.edu.iq	
Module Leader's Acad. Title		lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Ann Abdulsattar Ismail		**e-mail**	annabdulsattar@uomosul.edu.iq	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		02/06/2023	**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Exploration geochemistry &isotope geology	**Semester**	9
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية ***يتم كتابة اهم الأهداف التي تغطيها هذه المادة الدراسية بشكل جمل او فقرات توضح المواضيع التي سيتم التطرق اليها و دراستها و معالجتها)***	1. Clarification of how studying this course can make significant contributions to the geochemistry field. 2. Identify the principles of geochemistry and the study of the chemical components of the various internal parts of the earth . 3. This course deals with the behavior of elements during the stages of magmatic crystallization, chemical weathering processes and the laws that control them. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic 5. To understand the factors controlling the behavior of elements in sedimentary environments. 6. This course employs how to deal with behavior of the elements during the chemical weathering processes that occur on the surface of the earth, and Description the clay minerals.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية ***يتم كتابة اهم المُخرجات او الناتج و الكَم العلمي الذي يتم استخدامه للتدريس في هذه المادة على شكل أسئلة أساسية تخص منهاج المادة بأكمله و يجب ان لا تقل هذه المُخرجات من ناحية العدد عن 6 مُخرجات و يفضل ان تكون بعدد أسابيع الدراسة.***	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. Define geochemistry and describe its tool types. 2. Definitions of main terms and methods of geochemistry 3. Description the composition of the earth interior by using Seismic data. 4. Summarize what is meant the rocks of deep origin and how using to estimate the composition of earth's interior . 5. Discuss the chemical composition of the Earth Crust. 6. Explanation of the nature of mantle Material , Outer Core and Inner Core,. 7. Interpretation the Geochemistry of supergene and Hypogene environments. 8. Define Weathering and describe its types. 9. Explanation of factors controlling the behavior of elements in sedimentary environments. 10. Discuss the Colloids and colloidal systems . 11. Identify the Clay Minerals. 12. Description the classification of clay minerals.
Indicative Contents المحتويات الإرشادية ***يتم كتابة اهم العناوين الرئيسية للمواضيع بشكل متسلسل و التي تشمل كافة الفقرات التي تحتويها مع إدراج عدد الساعات المطلوبة لتنفيذ كل فقرة.***	Indicative content includes the following. Part A – Theoretical lectures Introduction , construction of the earth , Earth's Interior , Seismic data on the earth's interior , Density Distribution , Heat and Pressure Distribution , Material of earth interior , Rocks of Deep Origin : Ophiolite Complexes , Diamond bearing Kimberlite Pipes , Xenolith . , Experimental Studies , Earth Crust , The chemical composition of the Earth Crust. [10 hrs] Material of The Mantle , Material of the Upper Mantle , Transition Zone of Earth Mantle, Lower Mantle Material , Outer Core , Inner Core, Meteorite , Geochemical Classification of Elements . [8 hrs] Geochemistry of supergene environment , Hypogene Environment , Geochemistry of Sediment and Sedimentary Rocks , Weathering , Physical weathering , Chemical weathering , Chemical weathering reactions, Weathering products , Factors controlling the behavior of elements in sedimentary environments , Ionic potential

	for elements , Power (Potential) of hydrogen (pH) , Oxidation-reduction (redox) potential . [10 hrs] Eh -pH Relationships, Colloids and colloidal systems : Mechanisms for the formation of colloidal systems , Types of colloids , The reasons for the presence of charges on colloidal particles , The important of colloidal systems , Clay Minerals : Class of two layer minerals , Class of three layer minerals , Mixing layers clay minerals , Palygorskite – Sepiolite Group. [8 hrs] Revision problem classes [3 hrs] Part B – Practical labs Element distribution in igneous rocks (evaluation of Goldsmidt rules), The origin relationship of igneous rock from the chemical analysis, distribution of Cr and Ni in basic volcanic rocks, distribution of Zr and Hf in acidic igneous rocks, Aragonite stabilization in ancient limestone, Using the geochemical data as a stratigraphical correlation. [18 hrs] The geochemistry of phosphorites, calculation of the salt chemical formula in the lakes, geochemistry of lakes, oil migration, Eh-pH diagram, distribution of iron phases on Eh-pH diagram. [18 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies *يتم كتابة ملخص الاستراتيجية الرئيسية التي سيتم تبنيها في تقديم هذه المادة*	The course includes the principles of geochemistry and the study of the chemical components of the various internal parts of the earth, as well as the study of the behavior of elements during the stages of magmatic crystallization, chemical weathering processes and the laws that control them, as well as the factors controlling the behavior of elements in sedimentary environments. The course also contains an understanding of the geochemistry of clay minerals and their classification.

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	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / 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 الأسبوعي النظري

	Material Covered
Week 1	An introduction to geochemistry, Seismic data on the earth's interior ,
Week 2	Density, Heat and Pressure Distribution .
Week 3	Material of earth interior , Rocks of Deep Origin ,Experimental Studies .
Week 4	Earth Crust , The chemical composition of the Earth Crust .
Week 5	Material of the Upper Mantle of Earth.
Week 6	Material of the Transition Zone and lower Mantle of Earth .
Week 7	Material of the Outer Core and Inner Core.
Week 8	Meteorite , Geochemical Classification of Elements .
Week 9	Hypogene Environment , Supergene Environment , Geochemistry of Sediment and Sedimentary Rocks .
Week 10	Weathering , Physical weathering , Chemical weathering .
Week 11	Chemical weathering reactions , Weathering products.
Week 12	Factors controlling the behavior of elements in sedimentary environments : Ionic potential for elements , Power (Potential) of hydrogen (pH) .
Week 13	Oxidation-reduction (redox) potential , Eh -pH Relationships .
Week 14	Colloids and colloidal systems , Mechanisms for the formation of colloidal systems , Types of colloids, The reasons for the presence of charges on colloidal particles , The important of colloidal systems .
Week 15	Clay Minerals : Class of two layer minerals , Class of three layer minerals , Mixing layers clay minerals , Palygorskite – Sepiolite Group.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Element distribution in igneous rocks (evaluation of Goldsmidt rules).
Week 2	Lab 2: The origin relationship of igneous rock from the chemical analysis.
Week 3	Lab 3: Distribution of Cr and Ni in basic volcanic rocks.
Week 4	Lab 4: Distribution of Zr and Hf in acidic igneous rocks.
Week 5	Lab 5: Aragonite stabilization in ancient limestone.
Week 6	Lab 6: Using the geochemical data as a stratigraphical correlation. . [18 hrs .
Week 7	Lab 7: The geochemistry of phosphorites.
Week 8	Lab 8:. Calculation of the salt chemical formula in the lakes.
Week 9	Lab9: Geochemistry of lakes.
Week10	Lab 10: Oil migration.
Week 11	Lab 11: Eh-pH diagram.
Week 12	Lab 12: Distribution of iron phases on Eh-pH diagram.

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**White, W.M. (2001):** Geochemistry: An On-line textbook, John-Hopkins University press, 700p. **Mason, B. (1966):** Principle of Geochemistry, 3rd edition John Wiley and Sons Inc. 329p.	Yes Yes
Recommended Texts	**Misra K. M. (2012) :** Introduction to Geochemistry: Principles and Applications : Wiley-Blackwell , 452P. **White, W.M. (2018):** Encyclopedia of Geochemistry : Springer International Publishing, 1574p	No No
Websites		

Grading Scheme مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**structural geology I**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-35019**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rabeea Kh. Znad		**e-mail**	rabeeazinad@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr.Mahmood Abdulhaq Alsumaidai Dr.Saddam Essa Mostafa		**e-mail**	mahmodabdhaq@uomosul.edu.iq saddammostafa@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	23/04/2024		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To develop problem solving skills and understanding of structural geology through the application of techniques. 2. To understand properties of rocks material. 3. This course deals with the basic concept of stress,strain. 4. Study the behavior of rocks material under stress . 5. Study the modes of rocks deformation responses. 6. Study folds stuctures (in details)and folding as manner of ductile deformation.
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.Students will learn mechanical, force, stress, and deformation bases. 2. Define the brittle and ductile behavior of rocks and resulting structures under different physical factors. 3.learn the differences between deformation and strain. 4. Construct the moher circle for stress and calculate normal and shear stress. 5.Discus the moher circle for stress and determine the different state of Stability of site constructions. 6.Explain the strain path and finite strain . 7.Identifying the folds structures and its economic importance. 8. Provide experience with mapping, interpreting maps. 9. Drawing geological cross-sections. Determine the general attitude (strike and dip or dip direction) of the plane. This module is designed to help the students to become comfortable with the basics—to help him make the transition from naive curiosity to perceptive self-confidence.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A - Theoretical lectures.</u> Introduction to structural geology, relation with other geosciences. force and stress components .derivative normal and shear stress by triangularly and by moher circle for stress. factor controlling behavior of materials. Brittle and ductile deformation. Stress ellipsoid .example of stress in rocks. strain and strain ellipsoids. Inhomogeneous strain. Coaxial and Non Coaxial strain. progressive strain. strain path. descriptive fold elements in the field, <u>Part B – practical labs.</u> Fundamentals of geological mapping, maps of horizontal ,inclined and vertical beds, training to draw the geological cross sections, mapping of folded strata (simple and overturned)with complete labeling, map view of faulted strata by normal ,reverse and strike slip types and vertical side view(cross section). Angular unconformity maps interpretation. complex geological map (fold ,fault, unconformity)with explanation of sequential events .

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The strategy adopted in delivering the material to the students is to expand their horizons of thinking and deduction through participation and dialogue, as well as giving realistic examples during the presentation of the unit materials. In the laboratory, students are trained to read and interpret geological maps, as well as drawing cross sections. In the theoretical and scientific aspects, illustrations and computer programs are used to communicate ideas clearly. For the purpose of students acquiring field skills, several geological trips are required in addition to the summer application in which students practice geological survey methods and field descriptions of geological formations and geomorphological and structural features.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 to Structural Geology – objective of structural geology-scope of structural geology.
Week 2	Mechanical Principles-(force, stress -concept- resolution-and their types).strain and deformation.
Week 3	Three stages of deformation- (stress-strain diagrams)-brittle and ductile deformation structures.
Week 4	Factors controlling behavior of materials-temperature-confining pressure-time-solution-pore pressure-anisotropy and inhomogeneity.
Week 5	Relation of rupture to stress-properties of stress axes-stress ellipsoid- stress on surface and on a point-derivative of normal and shear stress.
Week 6	Moher circle for stress-derivative of normal and shear stress using Moher circle-mean stress and deviatoric stress-stress tensor.
Week 7	Relation rupture to strain- strain ellipse -use of strain ellipse on structural problems-strain path-homogeneous and inhomogeneous strain-
Week 8	Coaxial and Non-Coaxial Strain Accumulation-pure shear -simple shear-Graphic Representation of Finite Strain Ellipse in Two Dimension- strain field diagram-geological structures associated.
Week 9	Folds and folding-parts of fold-fold symmetry condition-folds types in true profile-
Week 10	Fold veregency-Refolded folds-Multilayers folds-harmonic fold -disharmonic fold-polyharmonic fold-
Week 11	Aspects of Geometrical classification of folds-ramsay classification of folds-dip isogons classification.
Week 12	Mechanisms folds formation-(flexure-shear and flow folding)-Nontectonic folds
Week 13	Faults folds relationships(fault related folds)
Week 14	Minor folds(types-locations and structural significance)
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1& week2	**Introduction of structural geology.**Topographic mapping .Review of geological maps and structures**. Concept of dip and strike; Outcrop patterns of different structures.** Horizontal and vertical strata. Determine the boundary of strata. Calculate thickness .drawing cross section. Vertical exaggeration effect.
Week3	Dipping strata. (two maps at least). Relationship between dip and gradient . deduce the direction of dip of the beds from the fact that there outcrops V down the valley.
Week 4	Construction of structure contour and calculate dip amount, direction. True and apparent dip. Construction cross section with scale.
Week 5	Calculate true and vertical thickness. Width of outcrop and topography. Inlier and outlier structures.
Week 6	Reading of Folding strata maps (anticline and syncline)(two maps at least)
Week 7	Symmetrical and asymmetrical folds. determine fold axes and Limbs .Axial plane .symbols of fold parts on the map .drawing cross section.
Week 8	Overturned folds maps. Deduce the overlimb direction from strike line value. determine strike direction and dip amount.
Week 9	Faults parts, classification, and the effect of faulting on outcrops. Deduce the fault type (normal or reverse) from the Strike line of fault plane. calculate the fault throw on the map.
Week 10	Cross section of the faulted area .located the fault trcae.calculate the heave and throw of the fault. determine the hanging wall and footwall. True and vertical beds thickness.
Week 11	Faulted folds. Plunging and non-plunging folds. Calculate plunge angle. The effect of faulting on fold structures outcrops.
Week 12	More folds and faulted folds. Complete outcrop beyond fault line.
Week 13	Unconformities maps (two maps at least). Angular unconformities ,top and bottom sets attitudes.
Week 14	Complex structures maps .
Week 15	Preparatory week before the final Exam.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Ramsay, J. G., 1967.** Folding and Fracturing of Rocks. McGraw-Hill book Co., New York, 568p. **Billings, M.P., 1972.** Structural Geology, 3rd ed. Prentice-Hall, USA.606p. **Ragan, D.M.,1983.** Structural Geology:An Introduction to Geometrical Techniques, JohnWiley&Sons,New York,393p. **Van der Pluijm, B.A. and Marshak, S., 2004**. Earth structure: An Introduction to Structural Geology and Tectonics. WCB/McGraw Hill, USA, 495p. **Davis G. H. and Reynolds S. J., Kluth F.Charles., 2006**. Structural Geology of rock . **Bennison G**.M. An Introduction to Geologucal Structures and Maps.1975. Third edition .Edward Arnold(publisher) ltd.london.	Yes
Recommended Texts	**Twiss, R. J. and Moores, E. M., 2007.** Structural geology. W.H. Freeman, USA, 717p. **Fossen Hakkon (2010), Structural Geology,** Cambridge University Press.480p. **Ramsay, J. G and Huber, M. I., 1987**. The techniques of modern structural geology. V.1Strain Analyses,. Academic press, London, 700p.	yes
Websites	https://www.soest.hawaii.edu/martel/Courses/GG303/	

Grading Scheme
مخطط الدرجات

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

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

MODULE DESCRIPTION FORM

Module Information					
Module Title	**Stratigraphy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-35023**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Maha Abdule Hameed Al-Hasson		**e-mail**	drmahamustafa@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Abdullah Sultan shihab		**e-mail**	abdhadidi65@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module		**Semester**	
Co-requisites module	General Geology 2	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1-sratigraphy (definition,relation with sedimentology,principles&historical review) 2-Organization of stratigraphic column,Evolution of Stratigraphic classification Code of stratigraphic Nomenclature. 4-Types of formal stratigraphic unit,Lithostratigraphic units. 5- Biostratigraphic units,chronostratigraphic units,chronologic units. 6-magnetostratigraphic units ,other units& informal units. 7-Lithosomes,Biosomes,geometrical classification of Lithosomes. 8-Stratigraphic relationships among Lithosomes. 9-Types of Stratigraphic relationships among Lithosomes. 10-Principle of correlation, Introduction. 11- Correlation of lithostratigraphy. 12-Parastratigraphic Units, Marker bed. 13-Methods of rocks units correlation. 14-Biostratigraphic units. 15-Indification sedimentary Environments.
Module Learning Outcomes	Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 1. List with description, methods of rocks units correlation. 2. Define the various terms marker bed with drawing them. 3. Definition of parastratigraphic units and drawing them. and mention importance in geoscience. 4.mention Summarize the continental of sedimentary. 5-Dicuss the marine environment with drawing them. 6-Define marker bed, Correlation, lagoonal env. Swampenv. 7-principles of stratigraphy ,definitions . 9-How organized the stratigraphic column&stratigraphic classification 10-define stratigraphic units , Lithostratigraphic units,Biostratigraphicm other formal&informal stratigraphic units. 11- define& sketch Lithosomes,Biosomes,Give geometrical classification of Lithosomes 12 Explain& sketch stratigraphic boundaries among lithosomes 13-Give differences between conformable& uncoformable relationships among Lithosomes.
Indicative Contents	Indicative content includes the following. Part A – Theoretical lectures Introduction, principle of correlation. Correlation of Stratigraphy, methods of rock correlation, biostratigraphy units, time Stratigraphy units, element and FACTORS, classification of sedimentary Environments, continental env. Terrestrial env., aquous env. Marine env. (18hrs).

	-sratigraphy (definition,relation with sedimentology,principles&historical review) ,Organization of stratigraphic column,Evolution of Stratigraphic classification Code of stratigraphic Nomenclature. Types of formal stratigraphic units(Lithostratigraphic units., Biostratigraphic units,chronostratigraphic units,chronologic units.,magnetostratigraphic units ,other units)& informal units. -Lithosomes,Biosomes,geometrical classification of Lithosomes. Stratigraphic relationships among Lithosomes.,Types of Stratigraphic relationships among Lithosomes(conformable:vertical&lateral),unconformable,compound relationships. Part B – Practical labs

Learning and Teaching Strategies

Strategies	Expanding students' perceptions about this science and its contents it includes that help in principle of correlation. Lithostratigraphic units, parastig. Units. Marker bed, methods of rocks units, sedimentary env.

Student Workload (SWL)

Structured SWL (h/sem) ا	63	**Structured SWL (h/w)** ا	4.2
Unstructured SWL (h/sem)	62	**Unstructured SWL (h/w)** ا	4.1
Total SWL (h/sem)	**125**		

Module Evaluation

تقييم المادة الدراسية

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

	Material Covered
Week 1	-sratigraphy (definition,relation with sedimentology,principles&historical review)
Week 2	Organization of stratigraphic column
Week 3	Code of stratigraphic Nomenclature.
Week 4	. Types of formal stratigraphic unit,Lithostratigraphic units. Biostratigraphic units,chronostratigraphic units,chronologic units.
Week 5	6-magnetostratigraphic units ,other units& informal units(Parastratigraphic,cyclostratigraphic, paleoclimatic units relative&Absolute age determination..
Week 6	-Lithosomes,Biosomes,geometrical classification of Lithosomes. 8-Stratigraphic relationships among Lithosomes.
Week 7	Types of Stratigraphic relationships among Lithosomes.
Week 8	Conpound relation ships, Hiatus m unconformity ,Regional& Local unconformity.
Week 9	correlation, correlation of lith stratigraphicby marker bed. .
Week 10	Methods of rocks unitsby position in stratigraphic section .
Week 11	Biostratigraphic units.
Week 12	Classification of sedimentary env.
Week 13	Continental Env. Terrestrial env. Aquous env.
Week 14	Transitional env.
Week 15	Marine env.

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Stratigraphic,principles,Geologic Time Scale ,Stratigraphic symboles& types of stratigraphic scales.
Week 2	Lithostratigraphic correlation
Week 3	. Panel diagram(Fence)correlation
Week 4	. Compound type section & lithocorrelation among several sections in outcrops
Week 5	lithocorrelation among several sections in in wells(subsurface sections)
Week 6	. Determination of Biozones& range chart
Week 7	Lihofacies mapss
Week 8	Biofacies maps
Week 9	Stratigraphic maps
Week10	π *diagram*
Week 11	Reafal limestone resorvior layer &countoring maps from subsurface sections.
Week 12	Clastic/non-clastic ratio map&physical/chemical sediments ratio map.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Armstrong, H. and Brasier, M. (2005). Microfossils Black well publishing , p. 296. Boggs,Sam.,(2004):principles of Sedimentology & Stratigraphy.4edition.Mervvil publishing company, United States of America.	Yes Yes
Recommended Texts	Stratigraphy by Al-Omari et. el., 1992,.	Yes No
Websites	https://www.youtube.com/watch?v=6w_TJS5j01M&ab_channel=UNCarchaeology	

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Micropaleontology II**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-35124**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	5	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Ibrahim Younis Ahmad		**e-mail**	ibrahimshareefi@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Omar Ahmed Mawlood		**e-mail**	omarbadrani@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Micropaleontology I	**Semester**	4
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. Clarification of how micropaleontology can make significant contributions to a wide range of scientific problems in geosciences. 2. Identify two microfossil groups (ostracode and calcareous nannofossil) which are useful in Geosciences. 3. This course deals with the basic concept of the most important and discriminatory morphological characters, anatomical, and taxonomic aspects of each fossil group. 4. Learn about the most important scientific terms (Terminology) and their definitions related to this topic. 5. To understand and comprehend the impact of these groups on stratigraphy, distribution, Paleoclimate and, paleoecology. 6. To perform different micropaleontology applications.
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. List with description, the different groups of organisms and the kingdoms that belong to them. 2. Define the various terms associated with micropaleontology. 3. What is ostracode? Definition, measurement of valves, orientation and importance in geoscience. 4. Summarize what is meant by external and internal features and structures of ostracode. 5. Discuss the reaction and involvement of ostracode in paleoecology, distribution, paleoclimat and stratigraphy. 6. Define Coccoliths, coccolithophores and Coccolithophores and the Biosphere. 7. Identify the Coccoliths and Coccolithogenesis. 8. Explain the Coccolith morphology and formation. 9. List and Describe the Ecology and distribution of Coccolithophores. 10. Discuss the functions of coccoliths. 11. Identify the relation of coccolith with climate changes. 12. Terminology.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Theoretical lectures</u> Introduction, organisms groups , types of microfossils, taxonomic position , general characteristic of ostracoda, importance of ostracoda study (as microfossils), morphology of ostracoda, calcareous parts , outer lamella, inner lamella, description of margins, features and structures used for the orientation of the carapace, external feature, internal features, ornamentation, terminology of ostracode, dimorphism. [*10* hrs] Ecology, distribution of marine ostracoda, factors controlled of the distribution of ostracoda, distribution of environments according to the salinity levels, Paleoecology. [*10* hrs] Primary producers in the sea, primary Production, coccolithophores, coccolithophores and the biosphere coccoliths and coccolithogenesis, nannofossils,

	nannoplankton, coccolith morphology and formation, heterococcoliths, holococcoliths, nannoliths. [*10* hrs] Ecology of coccolithophores, coccoliths and sedimentology, functions of coccoliths, geologic distribution, effect of global climate change on distribution, evolutionary responses, terminology of calcareous nannofossils. [8 hrs] Revision problem classes [5 hrs] <u>Part B – Practical labs</u> Shape, Overlap, measurements of carapace and valves, orientation, external features, external structures, internal features, internal structures, inner lamella, outer lamella, Hinge line, ornamentation, description of some index species. [18 hrs] coccolith shape, coccoliths orientation, Coccolith size, ultrastructure, types of ultrastructural component, element arrangement , structures spanning central-area, orientation in plan view, structures closing central-area, crystallography, systematic paleontology, description of some index species. [18 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Expanding students' perceptions about this science and its contents it includes that help in stratigraphic, paleoecologic, and paleoclimatic analysis. In addition to the use of different microscopes in distinguishing the types of microfossils through observations of the external and internal structures and their diagnosis. This will be achieved through lectures, labs, and interactive tutorials and by types of practical diagnostic methods for microfossils and involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**125**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	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 الأسبوعي النظري

	Material Covered
Week 1	Groups and kingdoms of organisms and types of microfossils.
Week 2	An introduction to ostracode, its definition, taxonomic status and, importance.
Week 3	General characteristics of ostracode, morphology, soft and calcareous parts.
Week 4	The features and structures used in the orientation of carapace and valves.
Week 5	External features and structures.
Week 6	Internal features and structures.
Week 7	Important terms (terminology).
Week 8	Ecology and palaeoenvironment of ostracode.
Week 9	Distribution of marine ostracode.
Week 10	Introduction to limestone nannofossils.
Week 11	Terminology related to the cocosphere, terminology related to coccoliths.
Week 12	Coccolithophore environment.
Week 13	Coccolith and sedimentation.
Week 14	Coccolith function.
Week 15	Systematic paleontology.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Shape, measurements of carapace and valves.
Week 2	Lab 2: Orientation of carapace and valves.
Week 3	Lab 3: External features, external structures.
Week 4	Lab 4: Internal features, internal structures.
Week 5	Lab 5: Inner lamella, outer lamella.
Week 6	Lab 6: Hinge line.
Week 7	Lab 7: Description of some index ostracode species.
Week 8	Lab 8: Preparing of Calcareous nannofossils slides.
Week 9	Lab9: Coccoliths shape description.
Week10	Lab 10: Coccoliths orientation.
Week 11	Lab 11: Element arrangement.
Week 12	Lab 12: Description of some index nannofossils species

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Armstrong, H. and Brasier, M. (2005**). Microfossils Black well publishing, p. 296. **Young, J. R. and Bown , P. R. (1997)**. Cenozoic calcareous nannoplankton classification. Journal of Plankton Researches, 19, 36-47.	Yes Yes
Recommended Texts	**Haq, B.U., Boersma, A., (1978)**. Introduction to marine micropaleontology. micropaleontology, Elsevier, New York, 376 p. **Perch-Nielsen, K. (1977)**. Albian to Pleistocene calcareous nannofossils from the western South Atlantic. Initial Rep. Deep Sea drill. Proj., Vol. 39, pp. 699-823.	Yes No
Websites	https://shop.elsevier.com/books/introduction-to-marine-micropaleontology/haq/978-0-444-82672-5 https://www.ucl.ac.uk/GeolSci/micropal/ostracod.html	

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	**Sedimentary Environments**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-36028**				
ECTS Credits	6				
SWL (hr/sem)	**150**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Rafee Ibrahim Al-Humidi		**e-mail**	Rafeegeo66@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Falah Abed AL-Miamary		**e-mail**	falahabed@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	02/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Sedimentary Petrology	**Semester**	4

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The study aims to employ sedimentary, biological and chemical evidence to infer the ancient sedimentary environment of the rock aggregates. With the aim of accurate estimation of water and hydrocarbon reservoirs, as well as areas of concentration of important ores and minerals as raw materials for mining industries.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Study of sedimentary evidence in petrographic which includes grain size, sorting, roundness and maturity, 2- As well as grains components, matrix and cementing material. 3-It is also interested in sedimentary structures, their diversity, and the method of their formation, 4-In addition to the biological content that is very important to know the place of their living, the depth of water, salinity, temperature, 5- The abundance of oxygen during their biological living period, 6-And thus collecting these evidences in order to know the sedimentary environment.
Indicative Contents المحتويات الإرشادية	Introduction to sedimentary environments - Classification of sedimentary environments Facies and Facies models, marine or nonmarine?, marine fossils, carbonate rocks, red beds, evaporite chemistry. Continental or terrestrial environments, Introduction, Fluvial systems, Alluvial fans, Sedimentary processes on fans. River systems, Channel form, Sediment Transport Processes in River, Floodplain Deposition, Characteristis of Fluvial Deposits, Palaeosols, How do you know it's Fluvial? Eolian Desert systems, Introduction, Global wind patterns, desert environment, Life in deserts, Characteristics of Aeolian deposits Lakes Environments, Introduction, Lake formation, Lake hydrology, freshwater Laks, Deep lake facies. Saline lakes, Life in Lakes, Characteristics of lake deposits. The Marine Realm: Morphology and Processes, Introduction, Divisions of the marine realm, Deltas Environment, Introduction, Classification of deltas, Fluvial-Dominated Deltas, Tide-Dominated Deltas, Wave-Dominated Deltas, Fan Deltas, Delta Cycles, Characteristics of deltaic deposits. Tidal flats Environment, Introduction, Tidal cycles, Depositional Setting, Sedimentary Processes and Sediment Characteristics of Tidal-Flats. Submarine fan Environment, Introduction, Channels and levees, Submarine fan systems, Gravel-rich systems, Sand-rich systems, Muddy systems Carbonate and Evaporite Environments; Carbonate, Introduction, Evaporite. Carbonate shelf (non reef) Environments, Depositional Setting,

	Sedimentation Processes Organic Reef Environment. Introduction, Depositional Setting, Reef Organisms. Reef Deposits, Low-Energy Reef Facies, high-Energy Reef Facies Lagoon Environment. Introduction, siliciclastic sediments& carbonate deposits, evaporites deposits, Life in lagoon, Characteristics of lagoon deposits. Skeletal grains (bioclasts), Microcrystalline carbonate (lime mud), Sparry calcite Carbonate Tidal flats Environment, Introduction, Tidal flats zones, subtidal zone, intertidal zone Supratidal zone, sabkha, Characteristics of Carbonate Tidal flats deposits. Pelagic Environment, Distribution of pelagic deposits, Calcite Compensation Depth (CCD). Dolomite Compensation Depth (DCD). Hemipelagic deposits, Characteristics of Pelagic deposits. Glacial Environment, Distribution of glacial environments, Glacial ice, Continental glacial deposition. Marine glacial environments, Distribution of glacial deposits, Ice, climate and tectonics, Summary of glacial environments.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Training students on how to invest all the information obtained from the previous academic stages, especially those related to sedimentary studies, And then collecting and linking them with the aim of reaching the sedimentary environment through sedimentary, biological, chemical, structural and geophysical evidence, both field and laboratory. Thus, the student is prepared to work in the state departments related to the geologist, how to deal with work requirements, confront problems and find solutions to them in the government and private sectors.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
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**		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

	Material Covered
Week 1	Introduction to sedimentary environments - Classification of sedimentary environments Facies and Faciec models, marine or nonmarine?,
Week 2	Continental or terrestrial environments, Introduction, Fluvial systems, Alluvial fans, Sedimentary processes on fans. River systems, Channel form, Sediment Transport Processes in River, Floodplain Deposition, Characteristis of Fluvial Deposits, Palaeosols, How do you know it's Fluvial?.
Week 3	Eolian Desert systems, Introduction, Global wind patterns, desert environment, Life in deserts, Characteristics of Aeolian deposits
Week 4	Lakes Environments, Introduction, Lake formation, Lake hydrology, freshwater Laks, Saline lakes, Life in Lakes, Characteristics of lake deposits.
Week 5	The Marine Realm: Morphology and Processes, Introduction, Divisions of the marine realm, Deltas Environment, Introduction, Classification of deltas, Fluvial-Dominated Deltas, Tide-Dominated Deltas, Wave-Dominated Deltas, Fan Deltas, Delta Cycles, Characteristics of deltaic deposits.
Week 6	Tidal flats Environment, Introduction, Tidal cycles, Depositional Setting, Sedimentary Processes and Sediment Characteristics of Tidal-Flats.
Week 7	Carbonate and Evaporite Environments; Carbonate, Introduction, Evaporite. Carbonate shelf (non reef) Environments, Depositional Setting, Sedimentation Processes
Week 8	Organic Reef Environment. Introduction, Depositional Setting, Reef Organisms. Reef Deposits

Week 9	Lagoon Environment. Introduction, siliciclastic sediments& carbonate deposits, evaporites deposits, Life in lagoon, Characteristics of lagoon deposits..
Week 10	Carbonate Tidal flats Environment, Introduction, Tidal flats zones, sabkha, Characteristics of Carbonate Tidal flats deposits..
Week 11	Pelagic Environment, Distribution of pelagic deposits, Calcite Compensation Depth (CCD). Dolomite Compensation Depth (DCD). Hemipelagic deposits, Characteristics of Pelagic deposits.
Week 12	Glaclal Environment, Distribution of glacial environments, Glacial ice, Continental glacial deposition.
Week 13	Marine glacial environments, Distribution of glacial deposits, Ice, climate and tectonics, Summary of glacial environments.
Week 14	Submarine fan Environment, Introduction, Channels and levees, Submarine fan systems,
Week 15	Summary.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Draw a sedimentary log.
Week 2	Lab 2: Alluvial fan environment.
Week 3	Lab 3: Fluvial environment.
Week 4	Lab 4: Desert environment.
Week 5	Lab 5: Transitional environment.
Week 6	Lab 6: Delta environment.
Week 7	Lab 7: Clastic Tidal flats environment.
Week 8	Lab 8: Carbonate Tidal flats environment.
Week 9	Lab9: Continental Shelf environment.
Week10	Lab 10: Submarine fan environment.
Week 11	Lab 11: Pelagic environment.
Week 12	Lab 12: Reef environment

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Nichols, G.,2009: Sedimentology and Stratigraphy, 2ed., Wiley Black well, 419P.**	Yes

	Boggs, S. Jr. 2006. Principles of Sedimentology and Stratigraphy, (4th ed.), Pearson Prentice-Hall, 662.P.	Yes
Recommended Texts	**Boggs, S. Jr. 2009. PETROLOGY OF SEDIMENTARY ROCKS, (2nd ed.), Cambridge University Press, New York, 612P.**	Yes No
Websites	https://www.youtube.com/watch?v=qIJbSV9N7p4 https://www.youtube.com/watch?v=VUj7Lq1Nprg	

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	**Basin analysis and sequence stratigraphy**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**GEO-36027**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	3		**Semester of Delivery**	6	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Mohammed Ahmed AL-Haj		**e-mail**	mohamedalhaj@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Ahmed Natheer Thanoon		**e-mail**	anf1277@uomosul.edu.iq	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	22/04/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	sedimentology ,Geotectonic, Sedimentary environments, Paleontology, stratigraphy	**Semester**	5,6,4,5,3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	The aims is to learn the following 1- What are the sedimentary basins and the Mechanisms of basins formation. 2- The Basin plains and basin axis and the Control factors on sedimentation. 3- Tectonic setting classification of sedimentary basins. 4- Introduce sequence stratigraphy concept in earth science. 5- understanding the application of sequence stratigraphy in sedimentology, paleontology and basin analyses including dividing stratigraphic column into system tracts.
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- Developing the student's skills to imagine from large scale view the geological processes in sedimentary basins. 2- Relate the sedimentological results or phenomena with the main causes factors of Geo-events. 3- knowing how these factors operating regionally and globally. 4- Developing the student's skills to imagine subsurface and surface vertical stacking pattern and lateral facies trend. 5- Use various types of data sets (Sedimentology, well log, Seismic, Paleontology) in sequence stratigraphic analysis. 6- Division the stratigraphic column into system tracts.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – Theoretical lectures (1 hour for each)</u> 1- Preface and introduction, Aims of basins analysis study, Sedimentary basin concept. 2- Mechanisms of basin formation, Basin plains, Vertical and horizontal basin zonation 3- Controls on sediment accumulation, Tectonic setting classification of sedimentary basins 4- basins related to lithospheric extension (divergent) 5- basins related to subduction (convergent) 6- basins related to strike slip tectonics. 7- basins related to crustal loading, complex and hybrid basins, the record of tectonics in stratigraphy. 8- Concepts and principles of sequence stratigraphy 9- Basin- margin concepts 10- Definitions of sea- level, Accommodation, sediment supply, Orders of cyclicity 11- Basin architecture (Progragation, Retrogradation, aggradation) 12- sequence boundaries and their correlative conformities 13- Systems tract definition and types. 14- Sequence stratigraphy of wireline logs

	Part B – Practical labs (2 hours for each) 1- Basins analysis methods 2- Tectonics and sedimentation 3- Properties of Iraq sedimentary basin 4- Divergent basins 5- Convergent basins 6- Sedimentary basins classification 7- Different scenarios of eustatic rises and falls in relative sea level . 8- How eustatic sea-level rise/ fall and subsidence / uplift can create / destroy accommodation. 9- Microfacies evidence for Sequence Startigraphic Analysis of an outcrop. 10- Stacking pattern of sedimentary tracts and draw sketch diagram showing facies. 11- Indicate the sedimentary tract, SB and MFS. and draw sketch diagram showing facies distribution. 12- Sequence Startigraphic , the impact of biofacies, sedimentation dilution and fossils dissolution on planktonic fossils distribution and abundance . 13- Rates of sea- level change and sediment supply.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Draw the student's attention to what basins are, how they control sedimentation, how all geological branches cooperate in analyzing the history of basin tectonics and its sediments, and how to benefit from the sedimentary basin resources. understand the application of sequence stratigraphy in basin analyses according to stacking pattern including dividing stratigraphic column into system tracts and sequence to reconstruct the basin develop.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1:30
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	All
	Assignments	2	10% (10)	2 and 12	All
	Projects / Lab.	2	10% (10)	Continuous	All
	Report	1	10% (10)	15	All
Summative assessment	Midterm Exam	2*1 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

	Material Covered
Week 1	Preface and introduction, Aims of basins analysis study, Sedimentary basin concept.
Week 2	Mechanisms of basin formation, Basin plains, Vertical and horizontal basin zonation
Week 3	Controls on sediment accumulation, Tectonic setting classification of sedimentary basins
Week 4	basins related to lithospheric extension (divergent)
Week 5	basins related to subduction (convergent)
Week 6	basins related to strike slip tectonics basins related to crustal loading.
Week 7	complex and hybrid basins, the record of tectonics in stratigraphy.
Week 8	principles of sequence stratigraphy
Week 9	Methods of Sequence Stratigraphic Analysis
Week 10	Relation between relative sea level, eustasy and tectonic
Week 11	The concept of accommodation Sediment supply
Week 12	Basin –Margin concepts
Week 13	Orders of sequences and Basin architecture
Week 14	Sequence boundary, System tract, Falling- stage system tract (FSST), Lowstand System Tract (LST)
Week 15	Transgressive Systems Tract (TST) and Highstant Systems Tract (HST)

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Basins analysis methods
Week 2	Tectonics and sedimentation
Week 3	Properties of Iraq sedimentary basin
Week 4	Divergent basins
Week 5	Convergent basins
Week 6	Sedimentary basins classification
Week 7	Different scenarios of eustatic rises and falls in relative sea level .
Week 8	Cases showing how eustatic sea-level rise/ fall and subsidence / uplift can create / destroy accommodation.
Week 9	Microfacies Evidence for Sequence Startigraphic Analysis of an outcrop (Sinjar Area –Avanah – Jaddala Formation)
Week10	Stacking pattern of sedimentary tracts and draw sketch diagram showing facies distribution , system tract and relation of sedimentary environment with sea level changes .
Week 11	Indicate the sedimentary tract, SB and MFS. and draw sketch diagram showing facies distribution
Week 12	Sequence Startigraphic , the impact of biofacies, sedimentation dilution and fossils dissolution on planktonic fossils distribution and abundance .

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	-Bogges(2006) Sedimentology and Stratigraphy - Nichols(2009) Sedimentology and Stratigraphy - Flugel(2010) Microfacies of carbonate rocks - Selley(2000)Applied sedimentology - Catuneanu(2006) Principle of sequence stratigraphy - Schlager (2002) Sedimentology and sequence stratigraphy of carbonate rocks	yes
Recommended Texts	Allen and Allen (2013): Basin Analysis: Principles and Application to Petroleum Play Assessment Posamentier, et al (1993): Sequence Stratigraphy and Facies Associations	

Websites	1- https://www.slideshare.net/SILENTANGEL6666/sedimentary-basins 2- https://www.slideshare.net/ShahadatSaimon/sedimentary-basins-243980430 3-

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.