Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2024

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

University Name: **Diyala**

Faculty/Institute: **College of Science**

Scientific Department: **Petroleum Geology and Minerals**

Academic or Professional Program Name: **Petroleum Geology and Minerals**

Final Certificate Name: **Bachelor in Petroleum Geology and Minerals**.

Academic System: Bologna process

Description Preparation Date: **20–7–2023**

File Completion Date: **20–3–2024**

Signature:

Head of Department Name:

Prof. Dr. Salah Ali Hussain

Date:**20–3–2024**

Signature:

Scientific Associate Name:

Prof. Dr. Munther Hamza Radhi

Date: **20–3–2024**

The file is checked by: **Assist Prof Ghasan Sabeeh Mahmood**

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Assist Prof Ghasan Sabeeh Mahmood

Date: **20–3–2024**

Signature:

Approval of the Dean

Prof. Dr. Taha Mohammad Hasan

1. Program Vision

The Department of Petroleum Geology and Minerals aspires to be a pioneering department in the fields of oil and minerals and their various applications with the aim of harnessing all available capabilities to serve society. It also aspires to make an effective contribution to achieving the goals of development plans in our dear country.

2. Program Mission

The Department of Petroleum Geology and Minerals is committed to preparing qualified cadres equipped with scientific and practical knowledge, concepts, and skills that enable them to perform their tasks efficiently and competently. The department is also committed to keeping pace with new developments in various geoscience specializations and actively participating in community service within the college's plan in this field and in harmony with quality and accreditation programs. Local and international academic.

3. Program Objectives

- Preparing and preparing qualified human energies capable of exploring and exploiting the natural resources that God has deposited in this blessed land.
- Preparing superior scientific cadres to complete their scientific studies (Master's and PhD) as a complement to the scientific cadres available in the department.
- Increase interaction and cooperation with institutions and bodies working in the field of earth sciences in general and in the field of oil and minerals in particular.
- Developing the applied scientific capabilities of associates and students through openness to applied scientific institutions and international companies with specialization by conducting applied training courses outside and inside Iraq.
- Providing consulting services to the public and private sectors in various fields of geological specializations.

4. Program Accreditation

Does the program have program accreditation? And from which agency?
No

5. Other external influences

No

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	**4**	**9**	**3.75**	
College Requirements	**4**	**19**	**7.9**	
Department Requirements	**39**	**206**	**85.8**	
Summer Training	**1**	**6**	**2.5**	
Other				

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours		
			theoretical	**practical**	**seminar**
First\ first	GEO1101	General Geology1	**2**	**2**	**1**
First\ first	GEO1102	Crystallography	**2**	**2**	**1**
First\ first	COS1103	Chemistry	**2**	**2**	
First\ first	COS1104	Mathematics 1	**2**		
First\ first	UD03	Computer	**1**	**2**	
First\ first	UD02	Arabic language	**1**		
First\ second	GEO1217	General Geology 2	**2**	**2**	**1**
First\ second	GEO1218	Mineralogy	**2**	**2**	**1**
First\ second	COS1209	Physics	**2**	**2**	

First\ second	COS12110	Mathematics 2	**2**	
First\ second	UD04	human rights and Democracy	**2**	
First\ second	UD01	English Language	**2**	
Second\first	GEO23015	Hydrology	**1**	**2**
Second\first	GEO24123	Stratigraphy	**2**	**2**
Second\first	GEO23016	**Geomorphology**	**1**	**2**
Second\first	GEO24024	**Sedimentology**	**2**	**2**
Second\first	GEO24119	**Crystallography**	**2**	**2**
Second\first	GEO23018	**Geophysics**	**2**	**2**
Second\second	GEO24021	**Engineering Geology**	**1**	**2**
Second\second	GEO23017	Paleontology	**2**	**2**
Second\second	GEO24122	**Remote Sensing**	**1**	**2**
Second\second	GEO35128	**sedimentary rocks**	**2**	**2**
Second\second	GEO23113	**Minerals Chemistry**	**2**	**2**
Second\second		**Geophysical Exploration**	**2**	**2**
third	GEGEG301	**Geochemistry and Exploration Geochemistry**	**2**	**2**
third	GEPG302	**Petroleum Geology**	**2**	**2**
third	GEGFG303	**Geotectonic and Field Geology**	**1**	**2**
third	GESGW304	**Subsurface Geology and Well Logging**	**2**	
third	GEGGS305	**GIS and geological and Statistical data analysis**	**2**	**2**
third	GEFBA306	**Microfacies and basin analysis**	**2**	**2**
third	GEGI307	**Geology of Iraq**	**1**	**2**
third	GESG308	**Structural Geology**	**2**	**2**
Fourth	**GEGP401**	**Graduate Project**	2	
Fourth	**GEEGP402**	**Environmental Geology and Pollution**	1	2
Fourth	**GEOIR403**	**Ores and Industrial rocks**	2	2
Fourth	GEPRW404	**Petroleum reservoir and well drilling**	1	2
Fourth	**GESEP405**	**Seismic Exploration**	2	2
Fourth	GEEG406	**Economic Geology**	1	2
Fourth	**GEPS407**	**Petroleum and geological software**	2	2
Fourth	**GEMG408**	**Mining Geology**	2	2
Fourth	**GEFW409**	**Field Work**	6	

8. Expected learning outcomes of the program

Knowledge	
Has an experience in oil and minerals exploration	satisfied
Skills	
Possess skills in using geological software	satisfied
He possesses basic skills to keep up with the labor market	satisfied
Ethics	
Knowledgeable of the values required by the work of a geologist in companies and departments	satisfied
Knowledgeable of some of the regulations and laws governing oil exploration	satisfied

9. Teaching and Learning Strategies

Teaching and learning strategies and methods adopted in the implementation of the program in general.

10. Evaluation methods

Implemented at all stages of the program in general.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Prof. Dr. Salah Ali Hussain	Geology	Stratigraphy and Paleontology			Staff	
Prof. Dr. Kareem Hussain Khwedim	Geology	Geochemistry			Staff	

Prof.Dr. Asem Ahmed Hassan	Geology	Engineering geology			**Staff**	
Prof.Dr. Munther Dhahir Nsaif	Geology	Geophysics			**Staff**	
Assist. Prof. Mouiad Tahir Ahmed	Geology	Geochemistry			**Staff**	
Dr. Abdul-Radha Mohammed Sahab	Geology	Petroleum Geology			**Staff**	
Dr. Ibrahim Mustafa Abbas	Geology	Petroleum Geology			**Staff**	
Dr. Rafid Abdul-Lateef Muaeen	Physics	Nano-physics			**Staff**	
Assist Lec. Abdul-Qader Adnan Khalaf	Geology	Sedimentology			**Staff**	
Assist Lec. Sara Ali Khalaf	Geology	Sedimentology			**Staff**	
Assist Lec. Ali Abdul-Jaleel Hussain	Geology	Structural Geology			**Staff**	
Assist Lec. Taghreed Abbas Abdul-Ameer	Geography	Geography			**Staff**	

Professional Development

Mentoring new faculty members

New faculty members are involved in ongoing courses, workshops, and seminars on various topics in order to develop their skills

Professional development of faculty members

Urging them to take courses on teaching methods, validity of teaching, and language integrity, and urging them to join research groups to learn the correct steps for doing research.

12. **Acceptance Criterion**
Central admission and special admission

13. **The most important sources of information about the program**
1- University requirements 2- College requirements - 3- Department requirements

14. Program Development Plan
Continuous follow-up with foreign universities, updating curricula periodically, and updating student evaluation methods

Program Skills Outline															
				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
First\ first	GEO1101	General Geology1	Basic	√	√	√		√	√	√		√	√	√	
First\ first	GEO1102	Crystallography	Basic	√	√	√		√	√	√		√	√	√	
First\ first	COS1103	Chemistry	Basic	√	√	√		√	√	√		√	√	√	
First\ first	COS1104	Mathematics 1	Basic	√	√	√		√	√	√		√	√	√	
First\ first	UD03	Computer	Basic	√	√	√		√	√	√		√	√	√	
First\ first	UD02	Arabic language	Basic	√	√	√		√	√	√		√	√	√	
First\ second	GEO1217	General Geology 2	Basic	√	√	√		√	√	√		√	√	√	
First\ second	GEO1218	Mineralogy	Basic	√	√	√		√	√	√		√	√	√	

First\ second	COS1209	Physics	**Basic**	√	√	√		√	√	√		√	√	√	
First\ second	COS12110	Mathematics 2	**Basic**	√	√	√		√	√	√		√	√	√	
First\ second	UD04	human rights and Democracy	**Basic**	√	√	√		√	√	√		√	√	√	
First\ second	UD01	English Language	**Basic**	√	√	√		√	√	√		√	√	√	
Second\first	GEO23015	Hydrology	**Basic**	√	√	√		√	√	√		√	√	√	
Second\first	GEO24123	Stratigraphy	**Basic**	√	√	√		√	√	√		√	√	√	
Second\first	GEO23016	**Geomorphology**	**Basic**	√	√	√		√	√	√		√	√	√	
Second\first	GEO24024	**Sedimentology**	**Basic**	√	√	√		√	√	√		√	√	√	
Second\first	GEO24119	**Crystallography**	**Basic**	√	√	√		√	√	√		√	√	√	
Second\first	GEO23018	**Geophysics**	**Basic**	√	√	√		√	√	√		√	√	√	
third	GEGEG301	**Geochemistry and Exploration Geochemistry**	**Basic**	√	√	√		√	√	√		√	√	√	
third	GEPG302	**Petroleum Geology**	**Basic**	√	√	√		√	√	√		√	√	√	

third	GEGFG303	**Geotectonic and Field Geology**	**Basic**	√	√	√		√	√	√		√	√	√	
third	GESGW304	**Subsurface Geology and Well Logging**	**Basic**	√	√	√		√	√	√		√	√	√	
third	GEGGS305	**GIS and geological and Statistical data analysis**	**Basic**	√	√	√		√	√	√		√	√	√	
third	GEFBA306	**Microfacies and basin analysis**	**Basic**	√	√	√		√	√	√		√	√	√	
third	GEGI307	**Geology of Iraq**	**Basic**	√	√	√		√	√	√		√	√	√	
third	GESG308	**Structural Geology**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	**GEGP401**	**Graduate Project**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	**GEEGP402**	**Environmental Geology and Pollution**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	**GEOIR403**	**Ores and Industrial rocks**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	GEPRW404	**Petroleum reservoir and well drilling**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	**GESEP405**	**Seismic Exploration**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	GEEG406	**Economic Geology**	**Basic**	√	√	√		√	√	√		√	√	√	

Fourth	**GEPS407**	**Petroleum and geological software**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	**GEMG408**	**Mining Geology**	**Basic**	√	√	√		√	√	√		√	√	√	
Fourth	**GEFW409**	**Field Work**	**Basic**	√	√	√		√	√	√		√	√	√	

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:
General Geology 1
2. Course Code:
GEO-111
3. Semester / Year:
First \ First
4. Description Preparation Date:
20−7−2023
5. Available Attendance Forms:
mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
200 hours \ 8 ECTS
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Salah Ali Hussain Email: dr.salah@uodiyala.edu.iq
8. Course Objectives

Course Objectives	1. Define selected vocabulary from the assigned chapters and employ them in understanding and explaining topics. 2. Discuss the basic principles of scientific inquiry and apply them to current research and to past discoveries of theories. 3. Differentiate between the three types of plate boundaries by noting common geologic features and processes. Summarize how these boundaries form. 4. Classify common physical properties and differentiate minerals and rocks. 5. Summarize the relationship between the chemical and physical properties of minerals. 6. Classify the igneous, metamorphic, and sedimentary rocks to determine how they formed. 7. Compare how different types of magma form and explain their relationship to the formation of intrusive and volcanic igneous features. 8. Compare and contrast weathering and erosion. 9. Identify strata, faults, and folds and summarize the forces and tectonic settings that lead to their formation.

	10. Apply the principles of relative dating to interpret the geologic history of a cross-section. Understand the geologic time scale. 11. Explain what causes earthquakes and earthquake destruction 12. Differentiate the internal structure and composi of the Earth. 13. Understanding the formation of some primary secondary structures. 14. Explain the various parts of the hydrologic c including the interaction of surface and groundw with the solid earth as well as features, and proce associated with streams.

9. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students. Students become active participants in a class when they write, discuss, and question the material given to them. Prepare students for successful scientific, technical or management in the geosciences or related fields. Encourage the growth of knowledge-based geology science.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 Week 2 Week3 Week4 Week5	5 5 5 5 5	1-Explain the structure and composition of the earth, and the fundamental geological processes that have shaped the Earth. 2-Explain key geological terms, definitions and theories (for example minerals, rocks, plate tectonics, weathering) 3-Define, classify and describe sediments, minerals, rocks and their formation 4-Discuss how different earth processes (for example plate tectonics, erosion, sedimentation) work and interact, and how different minerals, rocks and landforms that result from various processes. 5-Discuss the link between cause and effect for different geological processes (for example the forces driving plate tectonics)	Introduction to physical geology Historical notes, Absolute and relative time in Geology Structure of the earth, Mechanical layering of the Earth: lithosphere, asthenosphere, mantle and core. Structure of the earth, Formation of core, mantle, crust, Composition of crust: Continental and Oceanic. Plate tectonic theory and plate boundaries. Minerals of the earth, what are minerals – definition, Composition of common rock-forming minerals – internal atomic structure. Physical properties of minerals. Mineral's classification Chemical classification of minerals. Gems and ore minerals.	**Direct lecture** **Question answer** **smart board** **Smart screen**	**Homeworks** **quiz** **Monthly exams** **seminars**

Week6 Week7 Week8 Week9 Week10 Week11 Week12 Week13 Week14		6-Explain how hydrological cycle work and what are the stream and river processes. 7-Explain and define the features and structures that form by different geological processes such as volcanoes, stresses. 8-interpret (read and explain) cross sections and figures with geological data. 9-Summarize observations/data/principles graphically. 10-Recognise and discuss different geological structures, landforms and processes 11-Perform simple searches for relevant Earth Science literature, as well as cite sources correctly. 12-Use a precise geological language to describe and discuss geological processes and events. 13-Demonstrate the ability to function individually, in cooperation and ethically with others. 14-Acknowledge, evaluate and communicate the role of humans in, and our dependency and impact on the Earth system	Composition of common oxides, carbonates, sulphides and sulphates, phosphates Rocks (Rock cycle) Modes of magma generation in the crust and upper mantle. Magma and igneous intrusions, Physical properties of magma - temperature, viscosity, density and volatile content. Types of rocks, modes of emplacement of igneous rocks: volcanic, hypabyssal, plutonic Igneous rocks Texture of Igneous rocks, bases of classification of igneous rocks: mineralogical, textural, chemical. Sedimentary rocks Textural parameters of clastic sediments, Grain size: concept and size scale; particle shape and fabric; sedimentary textures. Sedimentary structures Paleontology: Study of fossils showing various modes of preservation Fossilization and fossil record Nature and importance of fossil record; Fossilization processes and modes of preservation		

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	-Physical geology by Steven Earle (2015). -laboratory manual in physical geology Vincet S. Cronin
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Stephen Marshak - Essentials of Geology-W. Norton & Company (2022)
Electronic References, Websites	

Course Description Form

1. Course Name:
General Geology 2
2. Course Code:
GEO1217
3. Semester / Year:
First \ First
4. Description Preparation Date:
20−7−2023
5. Available Attendance Forms:
mandatory
6. Number of Credit Hours (Total) / Number of Units (Total)
200 hours \ 8 ECTS
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	10. Apply the principles of relative dating to interpret the geologic history of a cross-section. Understand the geologic time scale. 11. Explain what causes earthquakes and earthquake destruction 12. Differentiate the internal structure and composi of the Ea 13. Understanding the formation of some primary secondary structur 14. Explain the various parts of the hydrologic c including the interaction of surface and groundw with the solid earth as well as features, and proce associated with streams.

9. Teaching and Learning Strategies

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Week6 Week7 Week8 Week9 Week10 Week11 Week12 Week13 Week14		6-Explain how hydrological cycle work and what are the stream and river processes. 7-Explain and define the features and structures that form by different geological processes such as volcanoes, stresses. 8-interpret (read and explain) cross sections and figures with geological data. 9-Summarize observations/data/principles graphically. 10-Recognise and discuss different geological structures, landforms and processes 11-Perform simple searches for relevant Earth Science literature, as well as cite sources correctly. 12-Use a precise geological language to describe and discuss geological processes and events. 13-Demonstrate the ability to function individually, in cooperation and ethically with others. 14-Acknowledge, evaluate and communicate the role of humans in, and our dependency and impact on the Earth system	Recognition of unconformity. 8- Weathering What are weathering, what is the erosion and what different between them. Weathering What are weathering, what is the erosion and what different between them. 10 Mass wasting What are mass wasting and cause 11- Mass wasting What are mass wasting and causes. 12- Hydrology Definition of hydrogeology, Hydrological cycle. **13-** Types of streams, stream loads, stream parameters. 14- Aquifers and Groundwater flow 15- Types of aquifers– unconfined, confined and semi-confined.		

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

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Course Description Form

1. Course Name:	
General Geology 2	
2. Course Code:	
GEO1217	
3. Semester / Year:	
First \ First	
4. Description Preparation Date:	
20-7-2023	
5. Available Attendance Forms:	
mandatory	
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	Understand the geologic time scale. 11. Explain what causes earthquakes and earthquake destruction 12. Differentiate the internal structure and composi of the Ea 13. Understanding the formation of some primary secondary structur 14. Explain the various parts of the hydrologic c including the interaction of surface and groundw with the solid earth as well as features, and proce associated with streams.

9. Teaching and Learning Strategies

Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students. Students become active participants in a class when they write, discuss, and question the material given to them. Prepare students for successful scientific, technical or management in the geosciences or related fields. Encourage the growth of knowledge-based geology science.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 Week 2 Week3 Week4 Week5 Week6	5 5 5 5 5	1-Explain the structure and composition of the earth, and the fundamental geological processes that have shaped the Earth. 2-Explain key geological terms, definitions and theories (for example minerals, rocks, plate tectonics, weathering) 3-Define, classify and describe sediments, minerals, rocks and their formation 4-Discuss how different earth processes (for example plate tectonics, erosion, sedimentation) work and interact, and how different minerals, rocks and landforms that result from various processes. 5-Discuss the link between cause and effect for different geological processes (for example the forces driving plate tectonics) 6-Explain how hydrological cycle work and what are	1-Structural geology Basic concept of rock deformation. Concept of Stress. Concept of strain: Homogeneous and inhomogeneous strain, Concept of brittle and ductile deformation. 2- Folds Fold morphology; elements of folds 3- Concept of strike and dip, trend and plunge Geometric and genetic classification of folds 4- Fractures and joints Faults, Faults and joints. What is fractures and faults, definition 5- Faults and types of faults Geometric classification of faults, Criteria for recognition of faults 6- Earthquakes Earthquake and earthquake belts: seismic waves 7- Unconformities Unconformity and its types, Recognition of unconformity.	**Direct lecture** **Question answer** **smart board** **Smart screen**	**Homeworks** **quiz** **Monthly exams** **seminars**

Week7 Week8 Week9 Week10 Week11 Week12 Week13 Week14		the stream and river processes. 7-Explain and define the features and structures that form by different geological processes such as volcanoes, stresses. 8-interpret (read and explain) cross sections and figures with geological data. 9-Summarize observations/data/principles graphically. 10-Recognise and discuss different geological structures, landforms and processes 11-Perform simple searches for relevant Earth Science literature, as well as cite sources correctly. 12-Use a precise geological language to describe and discuss geological processes and events. 13-Demonstrate the ability to function individually, in cooperation and ethically with others. 14-Acknowledge, evaluate and communicate the role of humans in, and our dependency and impact on the Earth system	8- Weathering What are weathering, what is the erosion and what different between them. Weathering What are weathering, what is the erosion and what different between them. 10 Mass wasting What are mass wasting and cause 11- Mass wasting What are mass wasting and causes. 12- Hydrology Definition of hydrogeology, Hydrological cycle. **13-** Types of streams, stream loads, stream parameters. 14- Aquifers and Groundwater flow 15- Types of aquifers– unconfined, confined and semi-confined.		

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	-Physical geology by Steven Earle (2015). -laboratory manual in physical geology Vincet S. Cronin
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Stephen Marshak - Essentials of Geology-W. Norton & Company (2022)
Electronic References, Websites	

Course Description Form

1. Course Name: Crystallography

2. Course Code: GEO-112

3. Semester 1 / Year: first

4. Description Preparation Date: 28/3/2024

5. Available Attendance Forms:

6. Number of Credit Hours (200) / Number of Units (8)

7. Course administrator's name (mention all, if more than one name)

Name: Muaiad Tahir Ahmed
Email: muaiad.tahir@ uodiyala.edu.iq

8. Course Objectives

Course Objectives	This course focuses on the fundamentals of crystallography. We will start from the External characteristics of crystals, the crystal systems, and the Elements of Crystal Symmetry. This course also covers the principles and applications of stereographic projections and their application to the cubic system, coordination number and Crystal structure. Through lectures and practical exercise, the students will be course enables understand the basic concepts of crystallography.

9. Teaching and Learning Strategies

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

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Course description A historical overview of crystallography, definition of metal and crystal, crystalline and amorphous matter	Introduction to Crystallography	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
2	5	.Properties of external crystals	External characteristics of crystals	Direct lecture Question and answer	home works quiz Monthly exams

		Parts of a crystal - faces-edge-sold angle-interfacial angle-crystal axes - symmetry elements - axial ratios and intersections - facet coefficients and Miller's index - crystal form and structure - zone		smart board Smart screen	seminars
3	5	The elements of symmetry in a crystal: plane of symmetry, axis of symmetry and center of symmetry.	Elements of Crystal Symmetry	Direct lecture Question and answer smart board Smart screen	Home works quiz Monthly exams seminars
4	5	crystal form and structure	Crystal Form & Habit	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
5	5	Describe the crystal axes, axial angles, crystal classes in the system, and elements of symmetry in the crystals of the system	Triclinic sys.	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
6	5	Describe the crystal axes, axial angles, crystal classes in the system, and elements of symmetry in the crystals of the system	Monoclinic Sys.	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
7	5	Describe the crystal axes, axial angles, crystal classes in the system, and elements of symmetry in the crystals of the system	Orthorhombic Sys.	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
8	5	Describe the crystal axes, axial angles, crystal classes in the system, and elements of symmetry in the crystals of the system	Tetragonal Sys.	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
9	5	Describe the crystal axes, axial angles, crystal classes in the system, and elements of symmetry in the crystals of the system	Hexagonal & Trigonal Sys.	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
10	5	Describe the crystal axes, axial angles, crystal classes in the system, and elements of symmetry in the crystals of the system	Cubic Sys.	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

11	5	Definition of twin crystals- Types of twins - twin laws - examples of metals	Twin Crystals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
12	5	Clinographic Projection for crystals	Crystal Drawing & Crystal Projection	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
13	5	axial ratios and intersections - facet coefficients and Miller's index - crystal form and structure - zone	Zone, Miller index, interplanar distance, coordination number	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
14	5	International Symmetry Symbols-Herman-mauguin Symbols	32 Crystal spacies	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
15	5	Types of structures - linear - two-dimensional – Bravais lattice	Crystal structure	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

11. Learning and Teaching Resources

Required textbooks (curricular books, if any)	**كتاب علم البلورات د.عبد الهادي يحيى الصائغ** 1- Manual of Mineralogy 20 Edition 2-Mimeralogy M. J. Hibbard 3- MINERALS Julie Kerr Casper, Ph.D. 4- Concepts in Geology A Text book for students of B.Sc. Dr. A. B. Chakranarayan, Head, Department of Geology, Fergusson College, Pune .
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	http://webmineral.com/crystall.shtml

Course Description Form

1. Course Name: Mineralogy

2. Course Code: GEO-122

3. Semester 2/ Year: first

4. Description Preparation Date: 28/3/2024

5. Available Attendance Forms:
mandatory

6. Number of Credit Hours (200) / Number of Units (8)

7. Course administrator's name (mention all, if more than one name)

Name: Muaiad Tahir Ahmed
Email: muaiad.tahir@ uodiyala.edu.iq

8. Course Objectives

Course Objectives	The module provides an introduction to common rock forming minerals and igneous, sedimentary and metamorphic rocks in hand specimen and using a petrological microscope. Students develop the ability to describe these geological materials and their properties at a range of scales and reach informed conclusions about their possible identity and origins.

9. Teaching and Learning Strategies

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

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Course description A historical overview of Mineralogy, definition of metal	Introduction to Minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
2	5	.physical properties are crystal form, color, hardness,	Physical Properties of minerals	Direct lecture Question and answer	home works quiz Monthly exams

		cleavage, and specific gravity etc		smart board Smart screen	seminars
3	**5**	Define Coordination Number and calculation Coordination Number Coordination types Pauling rules	Crystal Chemistry	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
4	**5**	Study of chemical formula, percentage contribution of individual elements, and other chemical properties of the minerals. Classification of minerals based on metallic/nonmetallic.	Chemical Formula of minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
5	**5**	Methods of classifying minerals Crystal chemistry classification Economic chemical classification chemical classification	Classification of minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
6	**5**	Define Native minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Native minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
7	**5**	Define Sulfide minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Sulfide minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
8	**5**	Define Sulfosalts minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Sulfosalts minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
9	**5**	Define Sulfate minerals group minerals examples:	Sulfate minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

		Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples			
10	**5**	Define Oxide & Hydroxide minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Oxide & Hydroxide minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
11	**5**	Define Halide minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Halide minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
12	**5**	Define Nitrate minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples Define Phosphate minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples Define Vanadate minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Nitrate & Phosphate & Vanadate minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

13	**5**	Define Carbonate minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Carbonate minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
14	**5**	Define Silicate minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Silicate minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
15	**5**	Define Fedspathoids minerals group minerals examples: Study of Crystalline properties Natural properties chemical composition Distinctive qualities Being in nature. minerals examples	Fedspathoids minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	1- Manual of Mineralogy 20 Edition 2-Mimeralogy M. J. Hibbard 3- MINERALS Julie Kerr Casper, Ph.D. 4- Concepts in Geology A Text book for students of B.Sc. Dr. A. B. Chakranarayan, Head, Department of Geology, Fergusson College, Pune .
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Geology.com http://webmineral.com/crystall.shtml http://webmineral.com/determin.shtml http://webmineral.com/

Course Description Form

13. Course Name:	
English language	
14. Course Code:	
UD01	
15. Semester / Year:	
2\2024	
16. Description Preparation Date:	
22/11/2023	
17. Available Attendance Forms:	
In attendance	
18. Number of Credit Hours (Total) / Number of Units (Total)	
50\2	
19. Course administrator's name (mention all, if more than one name)	
Name: Rafid Abdulateef Mueen S Email: dr.rafidmuen@uodiyala.edu.iq	
20. Course Objectives	
Course Objectives	• The module aims to develop the stude English skills in reading, writing, liste and speaking…… • ….. • …..
21. Teaching and Learning Strategies	
Strategy	Headway's trusted methodology combines solid grammar and practice, vocabulary development, and integrated skills with communicative role-plays and personalization. Authentic material from a variety of sources enables students to see new language in cont and a range of comprehension tasks, language and vocabulary exercises, and extension activi practice the four skills. 'Everyday English' and 'Spoken grammar' sections practice real-w speaking skills, and a writing section for each unit at the back of the book provides models students to analyze and imitate.
22. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	GRAMMAR, READING,MAIN COURSE SPEAKI LISTENING, VOCABULARY	Hello	Inattendance, students h groups dialogue, addition homework, d and mon exams, and preparation reports projects specific topics.	Formative assessment\ the exams J; Betty's assignment Seminars Summative evaluation\ Midterm test final exam
2	2	He/she/they His/her.where is from Countr Numbers 10-20,	Your world All about Yo		
3	2	Verb to be, negat questions, sh answers			
4	2	Possessive adjectives. Possessive 's. H have Adjective noun Irregu Plurals, the family	Familyand friends		
5	2	Present Sim I/you/we/they a Adjective + noun	The way I liv		
6	2	Present Sim He/she Quest and negati Adverbs frequency	Every day		
7	2	Question wo Subject Prono Object Prono Possessive Prono This and that	My favorites		
8	2	There is / Prepositions: in, under, next Vancouver-the l city in the wo What to do where to go	Where I live		
9	2	Was/were born I simple: irregu verbs It's a Jack Pollock. Telling	Time past		

		story from pictu Saying the dates English Past Stoirple irngdar rerts				
10	2	Past simple: regu and irregu Questions Negati	We had a gr time!			
11	2	Can / can't, Adve Adjective + noun Requests and off Some and any	I can do tha			
12	2	I'd like, You are w you eat, Discuss what is a good d Conversation v Adam,	Please thank You			
13	2	Present Continuo Presert Simple	here and no			
14	2	Future pl Revision: quest words, tenses. Se countries in se days	its time to g			
15	2	Irregular ve phonetic symb consonants vowels.	Verbs phonetic symbols			

23. Course Evaluation

Formative Assessment
Tests2 hours 5%(5) weight/weeks 5 10 12 15
Homework/6 hours/(20%) 20/2weeks 4 6 8 10 12
Seminars/2 hours/2% 5(5)Weight/weeks Continuous
Summary Assessment /
Midterm Exam /2 Hours / Weight 20% (10) / Week 7
Final exam / three hours / 50% (50) weight / week 16
Overall Rating 100

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	New Headway Beginner, by lizand jo soars
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://www.learnenglish.de/ https://www.englishgrammar.org/ https://www.phrasebank.manchester.ac.uk/

Course Description Form

25. Course Name:	
Mathematical 1	
26. Course Code:	
COS12110	
27. Semester / Year:	
1\2024	
28. Description Preparation Date:	
01\06\2023	
29.Available Attendance Forms:	
In attendance	
30.Number of Credit Hours (Total) / Number of Units (Total)	
8\30	
31. Course administrator's name (mention all, if more than one name)	
Name: Rafid Abdulateef Mueen Email: dr.rafidmueen@uodiyala.edu.iq	
32. Course Objectives	
Course Objectives	• This academic curriculum is a basic introductio learning the basics of calculus, trigonome logarithmic and exponential functions. The stu will learn methods of solution and application. module aims to: • 1- The objective required of the student in orde successfully pass the requirements of the cours to teach the student to make derivations for mathematical functions, as well as the method drawing them. • 2- The student's knowledge of distinguish between functions and drawing them • 3- Developing the student's ability to understand concept of differentiation and its applications....
33. Teaching and Learning Strategies	
Strategy	The main strategy that will be : A1- Students' ability to distinguish and cognitive perception (to diagnose general theor and principles in the study) A2-Future planning to link what the student has learned to daily life A 3- Practicing different types of mathematical proofs A 4 - self-reliance in the achievement of mathematics

	B - The soft skills objectives of the course B1 - skills to apply calculus B2 - skill to find ends B3 - skill to draw functions

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2		Integer numb and real numb intervals inequalities	1. Lecture, blackboard u and recitatio	Formative Assessment/Tests Assignment of my home Projects report Final Assessment / Midterm Exam Final exam
2	2		Properties of functions	2. Demos 3. Interactive discussion 4. Self-learni	
3	2		Domain and ra		
4	2		Graph of functi		
5	2		Limits		
6	2		Limits		
7	2		Continuous functions		
8	2		Special functio		
9	2		Derivatives		
10	2		Derivatives Special functio		
11	2		Mathematical models		
12	2		Lines		
13	2		Parametric equations		
14	2		Parametric equations		
15	2		Preparatory w before the f Exam		

35. Course Evaluation

Formative Assessment

Tests / 2 hours. Weighing 10% (10), 5 weeks and 10 Assignments/Hours 2.Weighing 10% (10), Week 2 and 12 Projects/1hr, 10% (10), Continuous Report/Hour 1 , Weight 10% (10),13 Week Final Evaluation Midterm Exam 2 hours 10,Weight % (10) 7,Week Final Exam/2 hours, 50% weight (50), week16 Overall rating/100% (100 marks)

36. Learning and Teaching Resources

Required textbooks (curricular books, if any	
Main references (sources)	Calculus, seven edition :Howard Anton, Irl Bivens, Step Davis. Calculus and Analytic Geometry by Thomas
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Google scholar, wiki

Course Description Form

37. Course Name:	
Mathematical 2	
38. Course Code:	
COS12110	
39. Semester / Year:	
2\2024	
40. Description Preparation Date:	
01\06\2023	
41.Available Attendance Forms:	
In attendance	
42.Number of Credit Hours (Total) / Number of Units (Total)	
30\4	
43. Course administrator's name (mention all, if more than one name)	
Name: Rafid Abdulateef Mueen Email:dr.rafidmueen@uodiyala.edu.iq	
44. Course Objectives	
Course Objectives	• This academic curriculum is a basic introduction to learning the basics of calculus, trigonometric, logarithmic and exponential functions. The student will learn methods of solution and application. The module aims to: • 1- The objective required of the student in order to successfully pass the requirements of the course is to teach the student to make derivations for all mathematical functions, as well as the methods of drawing them. • 2- The student's knowledge of distinguishing between functions and drawing them • 3- Developing the student's ability to understand the concept of differentiation and its applications.
45. Teaching and Learning Strategies	
Strategy	The main strategy that will be : A1- Students' ability to distinguish and cognitive perception (to diagnose gener theories and principles in the study) A2-Future planning to link what the student has learned to daily life A 3- Practicing different types of mathematical proofs A 4 - self-reliance in the achievement of mathematics B - The soft skills objectives of the course B1 - skills to apply calculus B2 - skill to find the derivative

46. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-5	10	tangent line and calcula the derivati of some functions using definition. Some forms differentiat , base series and differentiat of the powe function. Increase functionalit reduce functionalit and flood curves Implicit derivation a derivatives higher pow Borders, so application on borders Mean Value Theorem, Rolle's Theorem, L'Opital Ru Mean Value Theorem, Rolle's Theorem, L'Opital Ru Trigonome functions together ar fundamenta equivalent Inverse trigonomet functions w their differentiat Hyperbolic functions w their differentiat	Tangent and derivative lines, differentiation rules, curves, and some applications of boundaries Trigonome c hyperbolic calculation addition some theorems Integration and Some applicatio	In attenda and the of exter sources learning Teachin and learning method 1. Lectu blackbo use and recitatio 2. Demo 3. Interact discussi 4. Self-learning	Tests, assignme Projects/Labor ry. report Midterm Exam Final exam

		Inverse differentiat (integral) Basic theor integration properties integration Some application integration Integration trigonomet functions, inverse trigonomet functions, hyperbolic functions Preparator week be the final ex			

47. Course Evaluation

Formative Assessment
Tests / 2 hours. Weight 10% (10). Week 5-10
Assignment of my house 2 hours. Weight 10% (10). Week 2-12
Projects / one hour. Weight 10% (10). continuous
Report / one hour. Weight 10% (10). Week 13
Introductory Assessment
The midterm exam is 2 hours, 10% (10). Week7
Final exam 2 hours .50% (50) .week 16.
100% overall rating (100 marks)

48. Learning and Teaching Resources

Required textbooks (curricular books any)	
Main references (sources)	Calculus, seven edition :Howard Anton, Irl Bivens, Steph Davis. Calculus and Analytic Geometry by Thomas
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Google scholar , wiki

49. Course Name:
Physics
50. Course Code:
UoB12345
51. Semester / Year:
2\2024
52. Description Preparation Date:
01\06\2023
53. Available Attendance Forms:
In attendance
54. Number of Credit Hours (Total) / Number of Units (Total)
6\100
55. Course administrator's name (mention all, if more than one name)
Name: Rafid Abdulateef Mueen Email: dr.rafidmueen@uodiyala.edu.iq
56. Course Objectives

Course Objectives	• After completing the course, Students are able: Intended Learning 1- Have the knowledge of fundamental Computing Science that includes basic theory and concept of computer science, Mathematics, and Statistics, Programming Algorithm, Software Engineering and Information System. • 2- Able to demonstrate and analyze the basic property object/matter in the form of physical equation related to part kinematic, interaction force between particles/matter, harmo oscillator, the elasticity of the material, static and dynamic fl temperature and heat, and thermodynamic. • 3- Able to solve physics problems independently and respons with complete physical completion method • 4- Able to use the basic equations of physics in solving proble with Newton's laws of motion, work and energy, linear moment and collisions • 5- Able to analyze basic physical property based on mathemat concept and formulation about the elasticity of the mate harmonic oscillator, temperature and heat

	• 6- Able to distinguish the first and second thermodyna equations and able to analyze 4 thermodynamic processes (K) volume, isobaric, isothermal, and adiabatic and Able to design demonstrate the basic principles of physics in conduc experiments on object motion, temperature and heat, mathemat pendulum motion (K). • ..... • ..... • .....

57. Teaching and Learning Strategies

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

58. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-4	8	Viscosity and other secondary properties •Surface tensio	Cl te or In du or	In attendance and the use o external sour of learning Teaching a learning methods 1. Lecture, blackboard u and recitatio 2. Demos 3. Interactive discussion 4. Self-learni	Tests, Home Commission Projects/Lab atory. report Midterm Exa Final exam
5-10	12	• Compression a pressure gradie • Fluid element balance • Hydrostatic pressure distributions • Application to measure pressu • Hydrostatic forces acting on aircraft surfaces • Hydrostatic forces on curve surfaces • Hydrostatic forces in layere liquids	Cl te Tv Di ib or pr su in lic d		
11-1	10				

1 2 3 4 5 6 7 8 9 10-1 15	2 2 2 3 2 2 2 2 2 10 3	• Buoyancy and stability • Pressure distribution in solid body moti • Pressure measurement • Basic physical laws of fluid mechanics • Reynolds transport theor • Save the block • Linear momentum equation • Non-frictional flow: Bernoulli's equation • Angular momentum theorem • Energy equati Laboratory instructions and security and health instructions to ensure the safety of the student while in the laboratory	Cl te Th e: "C m m ar Re io of Co ro Vo m In du or ar gu ng	Practical section, Laboratories	

		prove the relationship between potent difference and current over lin resistance, find the resultar of forces that m at one point, Routers Determination c the melting poir of the wax of its cooling curve find the ground acceleration by pendulum Setting the fc length of a lens offset method	In du or th te ni es th D rt nt Pl ic . Ex ai hc to dr cu es ex m Ol s La N fo s		

			M ng pc Gı nc ac er or Dc rn at of Fc le h Rc ex ri nt Ar qu fy st er fo pr ic pe or nc Fi Ex m		

59. Course Evaluation
Formative Assessment Tests 2, %10(10) week 5-10 Homework2, %10(10) weeks2-12 Projects/Laboratory, %10 (10), 1Ongoing Report 1, (10) %10 week 13 Summary Evaluation Half Hour Exam 10% (10) Seventh week Final Exam Three hours, 50% (50) week 16

60. Learning and Teaching Resources	
Required textbo (curricular books any)	
Main referen (sources)	fluid mechanics fundamental and applications Cengel_Cimbala. Published McGraw-Hill 2006. Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, and Wade W. Huebsch, Fundamentals of Fluid Mechanics, John Wiley & Sons, 6th ed., 2009.
Recommended books and references (scientific journals, reports…)	Related books and magazines
Electronic References, Websites	Google Scholar, websites and wiki

Course Description Form

1. Course Name:
Organic Chemistry
2. Course Code:
3. Semester / Year:
2023−2024
4. Description Preparation Date:
21/4/2024
5. Available Attendance Forms:
In presence
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hrs.
7. Course administrator's name (mention all, if more than one name)

Name: Dr. mohammed Alwan Farhan
Email: mohammed_alwan@uodiyala.edu.iq

8. Course Objectives

Course Objectives	**–Learn about the basic principles of organic chemistry and understa theories and chemical reactions** **– Knowledge of the chemical components of substances, the interact methods and their behavior towards acids and bases** **– Students' ability to solve problems and explain the results obtai from chemical reactions**

9. Teaching and Learning Strategies

Strategy	Encouraging students and increasing their motivation for laboratory to learning and conducting experiments. Improve and expand skills Critical thinking for students through daily contributions in th lesson and homework.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	2	Understandi theories and chemical reactions	Introduction organic chemist	Direct Diction illustrative methods	Daily exams, homework, a monthly exams
Second	2	Understand and know the structures of chemicals	Hybridization	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
Third	2	Understand and know the structures of chemicals	Classification of organic compounds	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
fourth	2		Alkanes		Daily exams, homework, a monthly exams

Fifth	2	Ability to interpret results and solve proble using differe reaction pathways	Alkenes	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
Sixth	2		Carbcations	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
Seventh	2	Knowledge o methods for preparing chemicals	Reduction of alkynes	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
Ninth	2	Knowledge methods preparing chemicals	Isomers	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
Tenth	2	Study the pa of chemical reactions	Diagnosis of alkenes		Daily exams, homework, a monthly exams
Eleventh	2	Study the pa of chemical reactions	Dienes	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
twelve	2	Knowledg e of methods for preparing chemicals	Alkynes	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
Thirteen	2		Alkyne reactions	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
fourteen	2	Knowledg e of methods for preparing chemicals	Aromatic hydrocarbons	Direct Diction and illustrative method	Daily exams, homework, and monthly exams
Fifteenth	2	Study the paths of chemical reactions	Interactions of aromatic compounds	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
		Understan d the mechanics of preparing different chemicals	First semester exam	Direct Diction and illustrative method	Daily exams, homework, a monthly exams
		Diagnosis of various chemical compound s		Direct Diction and illustrative method	

		Distinguish between chemical compounds through active groups		Direct Diction and illustrative method	

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular boc if any)	
Main references (sources)	Organic Chemistry Second Edition [Robert Morrison and Rol Neilson Boyd
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://coappsc.uosamarra.edu.iq/wp-content/uploads/2022/01/%D9%85%D8%AD%D8%A7%D8%6%D8%B1%D8%A9-1-%D9%83%D9%8A%D9%85%D9%8A%D8%A7%D8%A1-%D8%B9%D8%B6%D9%88%D9%8A%D8%A9.pdf

Course Description Form

61. Course Name:	
Paleontology	
62. Course Code:	
GEO23017	
63. Semester / Year:	
First \ second	
64. Description Preparation Date:	
20−7−2023	
65. Available Attendance Forms:	
mandatory	
66. Number of Credit Hours (Total) / Number of Units (Total)	
125 hours \ 5 ECTS	
67. Course administrator's name (mention all, if more than one name)	
Name: Prof. Dr. Salah Ali Hussain Email: dr.salah@uodiyala.edu.iq	
68. Course Objectives	
Course Objectives	1. Students will be able to reconstruct the biological traits of extinct organisms. 2. Students will be able to interpret the modes of life of fossil organisms. 3. Students will be able to reconstruct the taphonomic history of a given fossil or fossil assemblage. 4. Students will be able to use the principles of taphonomy to predict what an "entire" community would have looked like based on preserved fauna. 5. Students will be able to determine evolutionary relationships among a set of organisms. 6. Students will be able to gather and analyze phylogenetic information. Students will be able to design a phylogeny of fam objects, imaginary fossils, or real organisms.
69. Teaching and Learning Strategies	
Strategy	Students will learn the basic concepts in lectures and apply these concepts in practical classes involving maps, seismic sections, and outcrop and subsurface log information. Previous field courses will be made explicit reference to in order to provide linkage from the field to the class..
70. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 Week 2 Week3 Week4 Week5 Week6 Week7 Week8 Week9 Week10 Week11 Week12 Week13 Week14 Week15	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1. Recognize, interpret and explain the geological, climatic and environmental processes that have shaped present-day landscapes and habitats. 2. Outline the major phases in the evolution of life on earth and describe key events as preserved in the fossil record. Describe the evolution of major groups of organisms and identify the anatomical links between extinct and living life forms.	Introduction to paleontology and nature of fossils Type of preservation Unaltered Soft and hard Parts Type of preservation - Altered hard Parts Type of preservation Altered hard Parts Sponge Coelenterates Mid-term Exam Bryozoans Brachiopoda Brachiopoda Gastropoda Pelecypoda Cephalopoda Arthropoda Arthropoda	**Direct lecture** **Question answer** **smart board** **Smart screen**	**Homeworks** **quiz** **Monthly exams** **seminars**

71. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

72. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Moore R.C., 1979. Treatise on inverteb paleontology. Geological Society of America. P.
Main references (sources)	Moore R.C., 1979. Treatise on inverteb paleontology. Geological Society of America. P.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://biodiversity.ku.edu/invertebrate-paleontology/publications

Course Description Form

73. Course Name:	
Stratigraphy	
74. Course Code:	
GEO24117	
75. Semester / Year:	
Second \ second	
76. Description Preparation Date:	
20−7−2023	
77. Available Attendance Forms:	
mandatory	
78. Number of Credit Hours (Total) / Number of Units (Total)	
125 hours \ 5 ECTS	
79. Course administrator's name (mention all, if more than one name)	
Name: Prof. Dr. Salah Ali Hussain Email: dr.salah@uodiyala.edu.iq	
80. Course Objectives	
Course Objectives	7. To examine controls on stratigraphic organisation of sedimentary strata within a time framework. 8. To examine the means by which a time framework can be established in sedimentary strata 9. To examine differences between lithostratigraphy and chronostratigraphy and to communicate formal stratigraphic nomenclature. 10. To introduce the concepts of sequence stratigraphy 11. To enable students to produce well constrained interpretations of the ways in which controlling processes operate to create stratigraphic organization and architecture.
81. Teaching and Learning Strategies	
Strategy	Students will learn the basic concepts in lectures and apply these concepts in practical classes involving maps, seismic sections, and outcrop and subsurface log information. Previous field courses will be made explicit reference to in order to provide linkage from the field to the class. the material given to them. Prepare students for successful scientific, technical or management in the geosciences or related fields. Encourage the growth of knowledge-based geology science.

82. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 Week 2 Week3 Week4 Week5 Week6 Week7 Week8 Week9 Week10 Week11 Week12 Week13 Week14 Week15	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1- Appreciate the concept of geological time and the differences between lithostratigraphy and chronostratigraphy. 2- Analyze stratigraphy in terms of space and time and to interpret likely controls on stratal patterns. 3- evaluate the geological controls of stratigraphic development. 4- apply formal stratigraphic nomenclature to the geological record. 5- develop an interpretation of geological history and stratigraphic evolution from a geological map. 6- problem solving through working on a range of data types to produce integrated solutions. 7- Working with others through the sharing of maps and sections in practicals and developing solutions. 8- Learning how to draw a simple to complicate stratigraphic column. 9- Correlate between sections. 10- Draw sub-surface Stratigraphic sections 11-Learning all about cutting and core stratigraphy.	**1-** Introduction to stratigraphy and sedimentary rocks 2- Geological time units and Geologic time scale 3- Stratigraphic units 4- Stratigraphic relationships 5- Lithostratigraphic units and facies 6- APPLICATIONS OF LITHOSTRATIGRAPHY 7- Mid-term Exam 8- Biostratigraphy and classification of organisms 9- Magnetostratigraphy 10- Subsurface Stratigraphy 11- Processing of seismic reflection data 12- Interpretation of seismic reflection data 13- Borehole stratigraphy 14- Borehole cuttings 15- Core	**Direct lecture** **Question answer** **smart board** **Smart screen**	**Homeworks** **quiz** **Monthly exams** **seminars**

83. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

84. Learning and Teaching Resources

Required textbooks (curricular books, if any)	-Physical geology by Steven Earle (2015). -laboratory manual in physical geol by Vincet S. Cronin
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Stephen Marshak - Essentials of Geology-W. Norton & Company (2022)
Electronic References, Websites	

Course Description Form

1. Course Name: **Optical mineralogy**

2. Course Code:

3. Semester 1 / Year: second

4. Description Preparation Date: 28/3/2024

5. Available Attendance Forms:
mandatory

6. Number of Credit Hours (125) / Number of Units (5)

7. Course administrator's name (mention all, if more than one name)

Name: Muaiad Tahir Ahmed
Email: muaiad.tahir@ uodiyala.edu.iq

8. Course Objectives

Course Objectives	This course is designed to achieve the general objectives in the form of outputs that the student is supposed to acquire after successfully completing the course, as follows: 1. The student learned about the different types of minerals using a polarizing microscope, based on their optical properties resulting from their interaction with light. 2. Identify the types of interference forms and the classification of minerals on their basis. 3. Identify the occurrence of important minerals and their distribution on the three types of rocks and how to differentiate between minerals within the same rock sample. 4. The student learns the systematic methods of studying minerals and their textures using a polarizing microscope.

9. Teaching and Learning Strategies

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

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	4	Description of Course and History	INTRODUCTION	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
2	4	Nature of light Some Definition in the Wave Theory Ray or Ray Path Beam of Light Wave Wavelength A amplitude Period Frequency Monochromatic Light Velocity of Light	Light	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
3	4	Isotropic and Anisotropic substances Vibration Direction Wave Normal Phase Wave Front or Wave Surface Refraction index Polarized Light The Electromagnetic Spectrum	Light	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
4	4	Dispersion Dispersion of Sunlight Fraunhofer Light Dispersion coefficient A absorption of Light Relationship between A absorption & Thickness Reflection and Refraction of Light Snells Law Critical Angle Relationship between Deflection of the Ray and Refractive index of the Medium	Light	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
5	4	Reflection and Refraction Method Polarization by Differential or Selective Absorption Polarization by Double Reflection Nicol Prism Wave Motion Phase, Phase Difference and Path Difference in simple Harmonic Motion Interference of Light Wave in the same plane	Methods for Producing Polarized Light	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
6	4	Type microscope Parts of Polarizing microscope Microscope Magnification The Proper use of the microscope Microscope A adjustment Focusing the Objective Determination of Vibration direction of the polarizer Perpendicularity of polars and A ligament of cross hairs to polars	Polarizing microscope	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

7	4	Optical indicatrix and ray velocity surfaces Optical indicatrix Ray velocity Relationship between atomic structure and isotropic minerals and passage of light Derivation of optical indicatrix and ray velocity surfaces Uses of ray velocity surfaces and optical indicatrix Refractive index measurement Relief Immersion methods Becke line method or center illumination method Oblique illumination method Dispersion colors in immersion method Effect of Temperature	Isotropic minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
8	4	(Flurite,Spinel,Opal,Lucite,Sodalite, Nosolite ,Garnet group,Volcanic glass) Factors affecting the interference color	Isotropic minerals description under the microscope	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
9	4	Coherent Light Calculation of Path Difference or Retardation Examination of A nisotropic Mineral thin section between crossed polars Transmission of light through the analyser Using wave light crossed polars Interference colors between crossed polars Parallel polars Factors affecting the interference color	INTERFERENCE OF LIGHT	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
10	4	Mineral orientation Thickness (t) Birefringence (B) Differential absorption Type of dispersion in the mineral Interference color chart of Michel levy chart Compensating plates or Accessory plate Determination of the slow and fast vibration direction of the mineral(addition and subtraction) Explanation of addition and subtraction Determination of order of interference color of mineral	INTERFERENCE OF LIGHT	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
11	4	Uniaxial minerals The uniaxial indicatrix Optic axis and indicatrix sections Optic axis Indicatrix sections Optic orientation of uniaxial crystals Applications of ray incidence on uniaxial crystals Section perpendicular to the optic axis Section of parallel to optic axis Section oblique to the optic axis	THE UNIAXIAL MINERALS	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

		Nature of interference figures Type of interference figures			
12	4	Distinguishing uniaxial minerals Determination of optic sign Using centered optic axis figure Using off centered optic axis figure Using flash figure Dispersion in uniaxial minerals Extinction in uniaxial minerals Parallel extinction Symmetrical extinction Adulatory of wavy extinction Color and pleochrosim Sign of elongation Uniaxial minerals description under the polarizing microscope: Rutile,Calcite,Apatite, Zircon,Tourmaline group,Quartz,Nepheline.	OPTICAL EXAMINATION OF UNIAIAL CRYSTALS	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
13	4	Biaxial indicatrix Indicatrix section construction method Interference figures in biaxial crystals Acute bisectrix figure Origin of isochromatic curves or isochromes Determination of vibrations in interference figure Origin of isogyres Centered optics axis figure Obtuse bisectrix figure Optic normal figure Semi random figures Random figures	BIAXIAL MINERALS	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
14	4	Determination of optic sign Distribution of vibration directions Acute bisectrix figure Obtuse bisectrix figure and optic normal figure Off- centered figures Extinction in biaxial crystals Factors affecting the type of extinction	Distinguishing biaxial minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
15	4	Sign of elongation Effect of section orientation on the sign of elongation Pleochrosim in biaxial crystals Descriptions of biaxal minerals : Nesosilicates,Cyclosilicates or ring sillicates,Inosilicates or chain sillicates,Phyllosilicates, Tectosilicates,Some important sedimentary minerals.	Distinguishing biaxial minerals	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	بصرية المعادن د.زكي عبد الجبار

	مقدمة في علم البلورات البصرية ف.دونالدوباس ترجمة د.باووز عبد الله كتانه
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://opengeology.org/Mineralogy/5-optical-mineralogy/

Course Description Form

85. Course Name: **Minerals chemistry**

86. Course Code:

87. Semester 2 / Year: second

88. Description Preparation Date: 28/3/2024

89. Available Attendance Forms:

mandatory

90. Number of Credit Hours (125) / Number of Units (5)

91. Course administrator's name (mention all, if more than one name)

Name: Muaiad Tahir Ahmed
Email: muaiad.tahir@ uodiyala.edu.iq

92. Course Objectives

Course Objectives	Student Learning Objectives During this module you will: 1. Describe periodicity in the chemical characteristics of elements listed in order of increasing atomic number or mass. 2. Predict element substitutions in minerals using chemical characteristics (electronegativity, ionic size, valence, etc.), and define element substitutions in common solid solution series as simple, coupled, omission, or interstitial. 3. Hypothesize which minerals have similar characteristics (physical and optical properties) on the basis of their chemical formulas, thereby demonstrating understanding the importance of anionic groups. 4. Demonstrate understanding of phase diagrams for any one-component system: anticipate reactions that occur due to a change in temperature or pressure, describe difference between displacive and reconstructive polymorphs, discuss element ordering on atomic sites in the formation of polymorphs. 5. Identify primitive and non-primitive unit cells.

93. Teaching and Learning Strategies

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

94. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Course description with an introduction to crystal chemistry	**Introduction of Minerals chemistry**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

2	4	Study of the components of the crust: eight elements: oxygen, silicon, aluminum, iron, calcium, sodium, potassium, and magnesium. The rest consists of elements such as titanium, hydrogen, phosphorus, manganese, sulfur, carbon, nickel, and others.	**Interior of the Earth & Composition of the Crust Rocks**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
3	4	Study Genesis of Minerals primary crystallization and the subsequent history of minerals, include structural transitions, changes in texture (e.g., grain coarsening), exsolution processes and chemical reactions (e.g., oxidation).	**Genesis of Minerals**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
4	4	Study of the components of magma: series of continuous and discontinuous reactions, silicate minerals, and crystallization temperature.	**The Igneous Environment**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
5	4	Study of the specific depositional environment of particular sedimentary rocks, which is unique in terms of physical, chemical and biological properties. Physical features of the sedimentary environment include water depth, speed and continuity of	**The Sedimentary Environment**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

		currents, and chemical study. Minerals formed in this environment			
6	4	Studying the change in pressure and temperature, hot liquids rich in elements, the combination of these factors and their effect on the formation of minerals	**The Metamorphic Environment**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
7	4	Dividing elements into major, minor, and trace elements. Types of classifications valence number, chemical bonds, crystal properties	**Geochemical classification of elements, valence number, chemical bonds, crystal properties**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
8	4	Study of the most common silicate minerals including quartz, feldspar, mica, amphibole, pyroxene, and olivine. Silica tetrahedrons composed of silicon and oxygen, form chains and sheets. Combining with other cations to form silicate minerals.	**Silicate minerals**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
9	4	Define Coordination Number and calculation Coordination Number Coordination types Pauling rules	**Coordination & Coordination Number**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
10	4	Study of crystal structures of minerals	**Crystal Structure**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
11	4	The study of atoms of the minor component (solute) substituting for atoms of the major component (solvent) in the lattice	**Atomic Substitution & Solid Solutions**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

		positions normally occupied by solvent atoms.			
12	4	1- Liquid phase Crystallization from a melt Crystallization from a liquid 2- Cas phase 3- Solid phase	**Formation and Growth of Crystals**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
13	4	Study examples of minerals	**Crystallization of Solid Solution**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
14	4	1- One component System 2- Two component System	**Phase Rule and the Chemical System**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars
15	4	1- Concentration Currents 2- Temperature Variations 3- Degree of super-saturation 4- Present of Impurities 5- Viscosity of solution 6- External form of the Crystal	**Crystal Growth**	Direct lecture Question and answer smart board Smart screen	home works quiz Monthly exams seminars

95. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

96. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	1- كيمياء المعادن والخامات د.عادل كمال جميل د.علي فليح عجام 2- علم البلورات د.عبد الهادي يحيى الصائغ د.فيصل عبد المجيد الكفيشي د.زكي عبد الجبار الجبوري

Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://www2.tulane.edu/~sanelson/eens211/crystal_chemistry.htm

Course Description Form

97.	Course Name: Hydrology
98.	Course Code:
99.	Semester / Year: Semester
100.	Description Preparation Date: 20-7-2023
101.	Available Attendance Forms: Mandatory
102.	Number of Credit Hours (Total) / Number of Units (Total): 60 hour
103.	Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Asem Ahmed Hassan Email: asem.ahmed@uodiyala.edu.iq	
104.	Course Objectives
Course Objectives	To gain knowledge about: 1. The basics of Hydrology as one of the Geology branches. 2. Importance of Hydrology, major aspects of Hydrology, divisions, and applications 3. The basic hydrological processes and terminologies 4. The role and career paths of a hydrogeologist. 5. The water cycle and its components. 6. Estimation of hydrological processes such as precipitation, evaporation, infiltration, Runoff, etc. 7. Flood and flood types and flood management. 8. The basics of groundwater hydrology.
105.	Teaching and Learning Strategies
Strategy	The main strategy that will be adopted in delivering this module is to encourage students to participate in the lectures and exercises and expand their thinking skills. Students will learn the basic concepts of Hydrology in lectures and apply these concepts in practical classes involving lab experiments and exercises.

106. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1	**4**	**Learn the basics of Hyrology and its applications**	**Introduction Hydrology**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
2	**4**	**Learn precipitation types and presentation of rainfall data**	**Precipitation**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
3	**4**	**Practice the calculation methods of precipitation**	**Calculation of Precipitation**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
4	**4**	**Describe types of water losses from precipitation**	**Abstraction From Precipitation: Water losses**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
5	**4**	**Learn the factors affecting infiltration of water and methods of infiltration measurement**	**Infiltration**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
6	**4**	**Learn the types of runoff, measurement, and characteristics**	**Runoff**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
7	**4**	**Describe the Hydrograph and its components**	**Hydrograph 1**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
8	**4**	**-**	**Exam 1**	**-**	**Monthly exams**
9	**4**	**Practice the Hydrograph measurement methods**	**Hydrograph 2**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
10	**4**	**Learn the main concepts of floods, their types**	**Floods**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
11	**4**	**Learn methods of flood control and protection**	**Flood Control**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
12	**4**	**Describe the basic concepts of groundwater, importance, and types**	**Groundwater**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**

13	**4**	**Learn types of groundwater wells and drilling methods**	**Wells**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
14	**4**	**Describe the types of groundwater movement and calculation**	**Groundwater movement**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
15	**4**	**-**	**Exam2**		**Monthly exam**

107. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc

108. Learning and Teaching Resources

Required textbooks (curricular books, if ar	
Main references (sources)	1. Engineering Hydrology by E.M. Wielson 2. Advanced Hydrology by V.T. Chow 3. Engineering Hydrology byR.K. Linsley
Recommended books and references (scientific journals, reports…)	Journal of Hydrology - Elsevier Journal of Hydrology - ScienceDirect.com
Electronic References, Websites	http://www.journals.elsevier.com/journal-of-hydrology/ http://www.sciencedirect.com/science/journal/00221694

Course Description Form

109.	Course Name: Engineering geology
110.	Course Code:
111.	Semester / Year: Semester
112.	Description Preparation Date: 20-7-2023
113.	Available Attendance Forms: Mandatory
114.	Number of Credit Hours (Total) / Number of Units (Total): 60 hour
115.	Course administrator's name (mention all, if more than one name)
	Name: Prof. Dr. Asem Ahmed Hassan Email: asem.ahmed@uodiyala.edu.iq
116.	Course Objectives

Course Objectives	To gain knowledge about: 9. The basics of Engineering as one of the applied branches of Geology 10. Importance of Engineering geology, major aspects of Engineering, and applications, The role and career paths of Engineering geologists. 11. The physical properties of soils and rocks 12. The engineering properties of soils and rocks 13. Stress, Strain, Strength, and Deformations in soils and rocks 14. Physical state and Consistency of soil. 15. The main principles of Site Investigation and soil sampling. 16. Geohazards and engineering problems of soil and rocks.

117.	Teaching and Learning Strategies
Strategy	The main strategy that will be adopted in delivering this module is to encourage students to participate in the lectures and exercises and expand their thinking skills. Students will learn the basic concepts of Engineering geology in lectures and apply these concepts in practical classes involving experiments and exercises.

118. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**4**	**Learn the basics of Engineering Geology**	**Introduction to Engineering Geology**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**

2	**4**	**Describe the Physical properties of soils and rocks and practice their calculations**	**Physical properties of soils and rocks**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
3	**4**	**Describe the engineering properties of soils and rocks and practice their calculations**	**Engineering properties of soils and rocks 1**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
4	**4**	**Learn the deformation types of soils and rocks**	**Engineering properties of soils and rocks 2**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
5	**4**	**Describe the soil states**	**Soil states**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
6	**4**	**Learn the Strength characteristics of soils and consistency**	**Strength characteristics**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
7	**4**	**Learn the site investigation stages and their importance**	**Site investigation**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
8	**4**	**-**	**Exam 1**	**-**	**Monthly exams**
9	**4**	**Learn the basics of soil investigation and stages**	**Soil investigation**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
10	**4**	**Describe the types of soil samples and sampling methods**	**Soil sampling**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
11	**4**	**Learn the basics of using the geophysical methods in site investigation**	**Application of Geophysical methods for site investigation**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
12	**4**	**Learn the types of Rapid and slow movements**	**Geohazards**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**

13	**4**	**Learn the basics of slope stability and types**	**Slope Stability**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
14	**4**	**Describe the main types of Engineering problems in soils and mitigation methods**	**Engineering problems of soils**	**Direct lecture Questions Data show**	**Homeworks quizzes reports**
15	**4**	**-**	**Exam2**		**Monthly exam**

119. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc

120. Learning and Teaching Resources

Required textbooks (curricular books, if ar	
Main references (sources)	1. Engineering Geology and Geotechnics by Bell, F. G., 1980. 2. Engineering Geology: Rock Engineering in Construction by Goodman, R.E., 1993 3. Engineering Geology: An Environmental Approach by Rahn, P. H., 1986 4. Engineering Geology by Zaruba, Q., and MenclL, V., 1976
Recommended books and references (scientific journals, reports…)	Engineering Geology- Elsevier Engineering Geology- ScienceDirect
Electronic References, Websites	http://www.journals.elsevier.com/engineering-geology http://www.journals.elsevier.com/engineering-geolo

Course Description Form

121.	Course Name: **geophysics**
122.	Course Code: GEO-216
123.	Semester / Year: **Semester**
124.	Description Preparation Date: **2024/ 3/ 20**
125.	Available Attendance Forms: **Attendance**
126.	Number of Credit Hours (Total) / Number of Units (Total): **60/ 3**
127.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Munther Dhahir** Email: **munther_hnt@uodiyala.edu.iq**	
128.	Course Objectives
Course Objective	1- . The course aims to equip the student with fundamental theory, and different geophysical methods that are used currently in different applications 2- The module will equip students with experience in a range of geophysical methods, carrying out surveys and associated data analysis and interpretation. How the various methods can be integrated will also be explored.
3- Teaching and Learning Strategies	
Strategy	• lectures are given to transfer the course material to the student in a simple and clear way • discussion will be open at each class to help students express their thoughts and ideas, and to improve theircommunication skills • students will be given group assignments to do team and individual research work to broaden theirknowledge and put into practice the different theories and concepts covered in the lectures.
4- Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Information about Geophysical method , classification , important limitation and application of geophysical method	Introduction	Direct teaching and visual tools	Note
2	4		Basic principles of Gravity method	Direct teaching and visual tools	Note
3	4		anomaly , methods of separation anomaly	Direct teaching and visual tools	Note
4	4		density determination	Direct teaching and visual tools	Quiz
5	4		Methods of interpretation		Note
6	4		Methods of interpretation	Direct teaching and visual tools	Note
7	4		First month exam		
8	4		Magnetic methods , Basic principles	Direct teaching and visual tools	Note
9	4		Magnetic field , theories on origin of magnetic field	Direct teaching and visual tools	Quiz
10	4		Temporal variations of magnetic field		
11	4		Magnetic survey design ,	Direct teaching and visual tools	Note
12	4		Electrical methods, Basic principles	Direct teaching and visual tools	Note
13	4		Electrodes Array	Direct teaching and visual tools	Note
14	4		Field Techniques of Measurements interpretation of resistivity data	Direct teaching and visual tools	Quiz

15	4	Second month exam
5- Course Evaluation		
10 theoretical + 10 practical + 5 (attendance, seminar, reports)= 25 + 50 final course exam = 100		
6- Learning and Teaching Resources		
Required textbooks (curricu books, if any)		
Main references (sources)		- Dobrin and Savit,1988,Introduction to geophysical prospecting - Kearey ,Brook,1984,An Introduction to geophysical prospecting - Parasnis,1986, Principles of applied geophysics - Reynolds , 1997,An introduction to Applied and environmental Geophysics
Recommended books and references (scientific journals, reports...)		
Electronic References, Website		

Course Description Form

129.	Course Name: **Sedimentology**
130.	Course Code: **GESSR 208**
131.	Semester / Year: **Semester**
132.	Description Preparation Date: **2024/ 3/ 20**
133.	Available Attendance Forms: **Attendance**
134.	Number of Credit Hours (Total) / Number of Units (Total): **60/ 3**
135.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Kareem Khwedim** Email: **kkhwedim@uodiyala.edu.iq**	
136.	Course Objectives
Course Objective	17. Describe how sediments and sedimentary rocks are formed through transport and deposition, with a basic insight into diagenesis and petroleum geology. 18. Identify the main types of sedimentary rocks, textures, ichnofacies and sedimentary structures, and able to reflect on the implications of their formation. 19. Describe the most important characteristics of continental and marine sedimentary environments. 20. Understand stratigraphic principles such as lithostratigraphy, biostratigraphy, chronostratigraphy and sequence stratigraphy. 21. interpretation of ancient environmental conditions in sediment source areas and depositional sites. 22. Study the constituents, textures, structures, and fossil content of the deposits laid down in different geological environments. By these means the students can differentiate between continental and marine deposits of the geologic record.
137.	Teaching and Learning Strategies
Strategy	This course has both theoretical and practical examination which form the summative assessments. Part of the summative assessments (continuous exams) are during the semester and another part is at the end of the semester.
138. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Introduction to the sedimentology science	Introduction	Direct teaching and visual tools	Note
2	4	Learning the sedimentary cycle from the source to the final destination	The sedimentary cycle	Direct teachi and visual to	Note
3	4	Learning how the chemical processes affect the rocks and sediments	Chemical weathering	Direct teaching and visual tools	Note
4	4	Know more information about different kinds of Particles and their analysis	Interpretation of Particle Size Analyses	Direct teaching and visual tools	Quiz
5	4	First Exam			
6	4	How to measure Porosity and Permeability	Measurements of Porosity and Permeability	Direct teaching and visual tools	Note
7	4	Know the types of secondary porosity	Secondary or Post depositional Porosity	Direct teaching and visual tools	Note
8	4	Learning all details about the aqueous processes	Aqueous Processes	Direct teaching and visual tools	Note
9	4	Know what is the Low-Density Turbidity Currents	Sedimentation from Low-Density Turbidity Currents	Direct teaching and visual tools	Quiz
10	4	Second Exam			
11	4	How to identify sediments resulting from gravitational processes	Gravitational Processes	Direct teaching and visual tools	Note
12	4	Learning about the types of Primary Inorganic Sedimentary Structures	Primary Inorganic Sedimentary Structures	Direct teaching and visual tools	Note

13	4	How to recognize syndepositional structures	Syndepositional (Intrabed) Structures	Direct teaching and visual tools	Note
14	4	Learning how to distinguish the Cross-Bedding, Slumps and Slides structures	Cross-Bedding, Slumps and Slides and Miscellaneous Structures	Direct teaching and visual tools	Quiz
15	4	Final Course Exam			

139. Course Evaluation

30 theoretical + 15 practical + 5 (attendance, seminar, reports)= 50 + 50 final course exam = 100

140. Learning and Teaching Resources

Required textbooks (curricular boo if any)	- Selley R.C., 2000, Applied sedimentology, second edition, Academic press, 543p.
Main references (sources)	- Nichols G., 2009. Sedimentology and Stratigraphy. Blackwell Publishing. 432p.
Recommended books and references (scientific journals, reports...)	- Journal of Geology and mining. - Journal of Geoarabia.
Electronic References, Websites	https://libguides.dickinson.edu/sedstrat/internet

Course Description Form

141.	Course Name: **Sedimentary rocks**
142.	Course Code: **GEO-226**
143.	Semester / Year: **Semester**
144.	Description Preparation Date: **2024/ 3/ 20**
145.	Available Attendance Forms: **Attendance**
146.	Number of Credit Hours (Total) / Number of Units (Total): **60/ 3**
147.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Kareem Khwedim** Email: **kkhwedim@uodiyala.edu.iq**	
148.	Course Objectives
Course Objective	23. Describe how sediments and sedimentary rocks are formed through transport and deposition, with a basic insight into diagenesis and petroleum geology. 24. Identify the main types of sedimentary rocks, textures, ichnofacies and sedimentary structures, and able to reflect on the implications of their formation. 25. Describe the most important characteristics of continental and marine sedimentary environments. 26. Understand stratigraphic principles such as lithostratigraphy, biostratigraphy, chronostratigraphy and sequence stratigraphy. 27. interpretation of ancient environmental conditions in sediment source areas and depositional sites. 28. Study the constituents, textures, structures, and fossil content of the deposits laid down in different geological environments. By these means the students can differentiate between continental and marine deposits of the geologic record.
149.	Teaching and Learning Strategies
Strategy	Students will learn the basic concepts in lectures and apply these concepts in practical classes involving maps, seismic sections, and outcrop and subsurface log information. Previous field courses will be made explicit reference to in order to provide linkage from the field to the class.
150. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	1- Describe how sedimentary rocks are classified, and describe the common sedimentary rock types. 2- Describe the processes of burial, lithification, and diagenesis. Describe how the size, mineralogy, and angularity of particles change as they are transported downstream in a river.	Origin, classification, and occurrence of sedimentary rocks	Direct teaching and visual tools	Note
2	4		Siliciclastic sedimentary rocks	Direct teaching and visual tools	Note
3	4		Classification of sandstones	Direct teaching and visual tools	Note
4	4		Mudstones and shales	Direct teaching and visual tools	Quiz
5	4		First Exam		
6	4		Coated grains: ooids, oncoids, and cortoids, Skeletal grains (bioclasts)	Direct teaching and visual tools	Note
7	4		Chemical/ biochemical sedimentary rocks	Direct teaching and visual tools	Note
8	4		Physical processes in deposition of evaporate	Direct teaching and visual tools	Note
9	4		Principal kinds of chert	Direct teaching and visual tools	Quiz
10	4		Second Exam		
11	4		Nodular chert	Direct teaching and visual tools	Note
12	4		Iron-rich sedimentary rocks	Direct teaching and visual tools	Note
13	4		Mineralogy and geochemistry	Direct teaching and visual tools	Note

14	4		Principal kinds of iron-formations and Principal kinds of phosphate deposits	Direct teaching and visual tools	Quiz
15	4	Final Course Exam			

151. Course Evaluation	
30 theoretical + 15 practical + 5 (attendance, seminar, reports)= 50 + 50 final course exam = 100	
152. Learning and Teaching Resources	
Required textbooks (curricu books, if any)	- Sam Baggs, JR. 2009, Petrology of Sedimentary Rocks, 2nd edition, Cambridge University press, 612p.
Main references (sources)	- Tucker, ME. 2011, Sedimentary Rocks in the field (a practical guide), 4th edition, 30p.
Recommended books and references (scientific journals, reports...)	- Journal of Geology and mining. - Journal of Geoarabia.
Electronic References, Website	https://www.mindat.org/min-49095.html

Course Description Form

153. Course Name: **Gemorphology and Remot sensing**

154. Course Code: **GEO-23016**

155. Semester / Year: **Semester**

156. Description Preparation Date: **2024/ 3/ 20**

157. Available Attendance Forms: **Attendance**

158. Number of Credit Hours (Total) / Number of Units (Total): **125/ 5**

159. Course administrator's name (mention all, if more than one name)

Name: **Abdulqader adnan khalaf**
Email: **abdulkader@ uodiyala.edu.iq**

160. Course Objectives

Course Objective	1- The course provides an overview of landforms, landforming processes, and landscape evolution. 2- In particular, it aims to shed light on various landforming processes and how these depend on climate and tectonic regimes, and time. 3- The course shall further convey an understanding of landforming processes on different temporal and spatial magnitudes.

161. Teaching and Learning Strategies

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

162. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	1- The student can	**Introduction of Geomorphology**	Direct teaching and visual tools	Note

2	3	explain principal terms, definitions and theories (e.g. conceptual approaches in geomorphology) 2- Describe landforms and landforming processes in different climate zones and tectonic regimes 3- explain different theories and models for landscape evolution 4- discuss the development of micro to mega scale landforms and their lifespans assess the mode of formation, age and history for landforms in Norway	**Topography**	Direct teaching and visual tools	Note
3	3		**Constructive and Destructive Processes**	Direct teaching and visual tools	Note
4	3		**Genetic Landform Classification**	Direct teaching and visual tools	Quiz
5	3		**First Exam**		
6	3		**Orogenesis**	Direct teaching and visual tools	Note
7	3		**Fractures and Joints**	Direct teaching and visual tools	Note
8	3		**Lava Domes**	Direct teaching and visual tools	Note
9	3		**Volcanic Landforms: Extrusive Igneous**	Direct teaching and visual tools	Quiz
10	3		Second Exam		
11	3		**River Systems and Fluvial Processes**	Direct teaching and visual tools	Note
12	3		**Flood plains**	Direct teaching and visual tools	Note
13	3		**Karst Landforms**	Direct teaching and visual tools	Note
14	3		**Aeolian Landforms**	Direct teaching and visual tools	Quiz
15	3	Final Course Exam			
163. Course Evaluation					

30 theoretical + 15 practical + 5 (attendance, seminar, reports)= 50 + 50 final course exam = 100	
164. Learning and Teaching Resources	
Required textbooks (curricu books, if any)	
Main references (sources)	- Topography,Landforms,and Geomorphology Department of Natural Sources South Carolina, geological survey
Recommended books and references (scientific journals, reports...)	- Landforms,by Christophersn,R.W.2004.Eiemental Geosystem.4th Ed (حسن رمضان سلامة ومورفولوجية
Electronic References, Website	

Course Description Form

165.	Course Name: **Principles of Geochemistry**
166.	Course Code: **GEGEG301**
167.	Semester / Year: **Semester**
168.	Description Preparation Date: **2024/ 3/ 20**
169.	Available Attendance Forms: **Attendance**
170.	Number of Credit Hours (Total) / Number of Units (Total): **60/ 3**
171.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Kareem Khwedim** Email: **kkhwedim@uodiyala.edu.iq**	
172.	Course Objectives
Course Objective	29. Apply geochemical principles to solve many types of geological problems. 30. The student will be able to know the areas of exploration about the natural resources such as minerals and oil through geochemistry, and knowing that the principles and laws of geochemistry have contributed to understanding and interpreting many problems, such as global warming and ozone gas depletion, as well as soil and water pollution problems. 31. Teaching the student the chemical reactions that occur underground and on the surface, the nature and divisions of the earth, and everything related to the chemistry of the elements, their movement, and rock forming minerals. 32. Students should be able to read and understand articles in geochemical.
173.	Teaching and Learning Strategies
Strategy	When teaching, the goal is to instill in our students a high level of excitement about the material and confidence in their abilities to apply new-found knowledge to real-world problems. In the classroom, we prefer using alternative teaching methods to augment lectures (e.g., inquiry assignments, collaborative learning periods, demonstrations, active hands-on learning with mineral and rock specimens), as these types of teaching strategies often improve students' critical thinking skills, conceptual understanding of materials, confidence in scientific knowledge, and interest in and retention in STEM fields.

	When implementing a new teaching method, however, it is critical to determine if the intervention is an improvement over the old to ensure that student learning is optimized and not negatively impacted.

174. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	3- Know more information about major, minor, and trace elements. 4- Discuss the rates of chemical reactions 5- Explain specific and non-specific adsorption 6- Perform simple experiments to demonstrate adsorption 7- Predict the stability of minerals 8- Use computer models to predict mineral stability and water chemistry 9- Apply isotopes for temperature reconstruction and dating Explain and predict redox reactions.	Introduction	Direct teaching and visual tools	Note
2	4		Principles of Geochemistry and Chemical Weathering Processes	Direct teaching and visual tools	Note
3	4		Origin and Development of the Solid Earth	Direct teaching and visual tools	Note
4	4		Ionic potential, Sorption, and types of sorption	Direct teaching and visual tools	Quiz
5	4		First Exam		
6	4		Ionic substitution	Direct teaching and visual tools	Note
7	4		Hydrogen- ion concentration (pH) and oxidation-reduction potentials (Eh)	Direct teaching and visual tools	Note
8	4		Geochemical classification of elements	Direct teaching and visual tools	Note
9	4		Geochemical cycles, Cycles 1, 2	Direct teaching and visual tools	Quiz
10	4		Second Exam		
11	4		Cycles 3, 4, 5	Direct teaching and visual tools	Note

12	4		Meteors, meteorites and comets, Classification of meteorites	Direct teaching and visual tools	Note
13	4		Geochemistry of trace elements, Geochemistry of sedimentary rocks	Direct teaching and visual tools	Note
14	4		Geochemical fences	Direct teaching and visual tools	Quiz
15	4	Final Course Exam			

175. Course Evaluation

10 theoretical + 10 practical + 5 (attendance, seminar, reports)= 25 + 50 final course exam = 100

176. Learning and Teaching Resources

Required textbooks (curricu books, if any)	- Al-Barede F., 2012, Geochemistry an Introduction, University of Cambridge, University press (2nd edition), 357p.
Main references (sources)	- Misra KC. 2012, Introduction to Geochemistry Principles and Applications, John Wiley and Sons, Ltd, 456p.
Recommended books and references (scientific journals, reports...)	- Journal of Geology and mining. - Journal of Geoarabia.
Electronic References, Website	http://www.geo.cornell.edu/geology /classes/Geochemweblinks.HTML

Course Description Form

177. Course Name:
microfossils
178. Course Code:
GEO35130
179. Semester / Year:
First \ Third
180. Description Preparation Date:
20−7−2023
181. Available Attendance Forms:
mandatory
182. Number of Credit Hours (Total) / Number of Units (Total)
125 hours \ 5 ECTS
183. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Salah Ali Hussain Email: dr.salah@uodiyala.edu.iq

184. Course Objectives

Course Objectives	1- To identify a number of microfossil groups useful in Geosciences. 2- To learn about Morphological/anatomical and taxonomic aspects are observed and highlighted based on lengthy observations and drawings of our teaching collections. 3- To understand and familiarize students with the most important and discriminatory morphological characters proper to each Fossil Group. 4- To familiarize Student in making use of the avail taxonomic catalogues and identification keys, used routi by specialists in the field.

185. Teaching and Learning Strategies

Strategy	Students will learn the basic concepts in lectures and apply these concepts in practical classes involving maps, seismic sections, and outcrop and subsurface log information. Previous field courses will be made explicit reference to in order to provide linkage from the field to the class..

186. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1 Week 2	5 5	33. Micropaleontology can make significant	1-Microfossils – what are they 2-Microfossils and biostratigraphy and	**Direct lecture** **Question and answer**	**Home** **rks**

Week3 Week4 Week5 Week6 Week7 Week8 Week9 Week10 Week11 Week12 Week13 Week14 Week15	5 5 5 5 5 5 5 5 5 5 5 5 5	contributions in a wide range of scientific problems in Geosciences. 34. Student can interpret Environmental and Evolutionary trends. 35. The potential of application of microfossils lies with their identification at species/genus level. The student will acquire some basic skills that will help him/her recognize major microfossil groups based on his/her own identifications.	3-foraminifera 4- Wall structure and composition 5- Foraminiferal ecology 6- Larger benthic 7-Planktonic foram ecology 8- Classification of foraminifera 9- Classification of foraminifera 10-Ostracoda 11-The Ostracoda carapace 12-Ostracoda distribution and ecology 13-Ostracoda distribution and ecology 14-Ecology 15-Classification	**smart board** **Smart screen**	**quiz** **Monthly exams** **seminars**

187. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

188. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Brasier, M. and Armstrong, H. 2005. Microfossils. Blackwell publishing. 305 P.
Main references (sources)	Haq, B.U. and Boersma A. 1998. INTRODUCTION T MARINE MICROPALEONTOLOGY. Elsevier Scien (Singapore). 385 P.
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://www.micropress.org/micropaleontology.html

Course Description Form

189.	Course Name: **well logs**
190.	Course Code: GEO-216
191.	Semester / Year: **Semester**
192.	Description Preparation Date: **2024/ 3/ 20**
193.	Available Attendance Forms: **Attendance**
194.	Number of Credit Hours (Total) / Number of Units (Total): **60/ 3**
195.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Munther Dhahir** Email: **munther_hnt@uodiyala.edu.iq**	
196.	Course Objectives

Course Objectives	The objectives of this course are for students to 1- Become familiar with log types and their techniques. 2- The mechanism of wireline log running, and the function of each log. 3- Interpretation of the log curves and their behaviors opposite the different subsurface geological conditions. 4- Estimation of the essential reservoir parameters from logs such as lithology, borehole condition, porosity, permeability, fluid saturations (reservoir characterization

7- Teaching and Learning Strategies

Strategy	• lectures are given to transfer the course material to the student in a simple and clear way • discussion will be open at each class to help students express their thoughts and ideas, and to improve theircommunication skills students will be given group assignments to do team and individual research w to broaden theirknowledge and put into practice the different theories and conce covered in the lectures.

8- Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Information about Types of logs , Classification operation system & Borehole Environment . interpretation of well log data , reservoir evaluation using log data	Introduction to Well Logging	Direct teaching and visual tools	Note
2	3		Caliper Log	Direct teaching and visual tools	Note
3	3		Sp log	Direct teaching and visual tools	Note
4	3		Gamma Ray Logs	Direct teaching and visual tools	Quiz
5	3		Density Log , Photo Electrical Factor Log		Note
6	3		Neutron Log and Lithology Determination from Logs	Direct teaching and visual tools	Note
7	3		First month exam		
8	3		Sonic Log	Direct teaching and visual tools	Note
9	3		Resistivity Logs (Induction Log)	Direct teaching and visual tools	Quiz
10	3		Resistivity Logs (Lateral Log)		
11	3		Micro Resistivity Logs	Direct teaching and visual tools	Note
12	3		Image Logs and Quick Look Methods	Direct teaching and visual tools	Note
13	3		Quick Look Methods	Direct teaching and visual tools	Note
14	3		Reservoir evaluation	Direct teaching and visual tools	Quiz

15	3	Second month exam

9- Course Evaluation	
10 theoretical + 10 practical + 5 (attendance, seminar, reports)= 25 + 50 final course exam = 100	
10- Learning and Teaching Resources	
Required textbooks (curricu books, if any)	
Main references (sources)	The Geological Interpretation of well logs (2000), Malcolm Rider (second edition), Whittles Publishing. 2. Darling, T., 2005, Well logging and Formation Evaluation, Elsevier, Amsterdam, 326p. 3. Asquith, G., and Krygowski, D., 2004, Basic Well Log Analysis, AAPG Methods in exploration 16, Tulsa, Oklahoma, USA, 244p.
Recommended books and references (scientific journals, reports...)	1. Schlumberger publications. 2. Asquith, G. B., 1985, Handbook of Log Evaluati Techniques for Carbonate Reservoirs, AA Tulsa, Oklahoma, USA, 53p
Electronic References, Website	

Course Description Form

197.	Course Name: **Sedimentary rocks**
198.	Course Code: **GEO-416**
199.	Semester / Year: **Semester**
200.	Description Preparation Date: **2024/ 3/ 20**
201.	Available Attendance Forms: **Attendance**
202.	Number of Credit Hours (Total) / Number of Units (Total): **45/ 2**
203.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Kareem Khwedim** Email: **kkhwedim@uodiyala.edu.iq**	
204.	Course Objectives
Course Objectives	36. Understanding different types of natural disasters (flooding, volcanic eruption, earthquakes …. Etc.), and interactions between humans and their environment. 37. Describe and compare the main sources of legacy and emerging environmental pollutants and their associated regulations. 38. Characterize the impact of pollution on human and environmental health by critically compiling data from a range of sources. 39. Recommend ways to improve the management of man-made chemicals including mitigation and remediation approaches considering the social, cultural, environmental and economic constrains.
205.	Teaching and Learning Strategies
Strategy	**Strategies for teaching Environmental geology:** ✓ There are a number of strategies for teaching Environmental that can really make an impact. ... ✓ Online Exploration. ... ✓ Interviews and Guest Speakers. ... ✓ Field Trips and Nature Walks. ... ✓ Role of the Teacher.
206. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Students completing this course will: 10- Display understanding into how the scientific method is applied to environmental issues. 11- Demonstrate through labs, exams, and projects a foundation in environmental geology. 12- Identify underlying geological principles affecting environmental issues. 13- Understand and analyze the effects of tectonic plate movement on natural hazards such as volcanoes, landslides, earthquakes, hurricanes, waves, and floods, and the effects of these 14- hazards on humans and the environment. 15- Describe the geologic factors affecting the use, supply, contamination, and treatment of surface and groundwater resources 16- Identify the geological aspects of waste management and disposal 17- Interpret and discuss issues surrounding several environmental case studies 18- Recognize the relationships between humans and the environment, particularly the effects of population growth on natural systems including soil	Introduction	Direct teaching and visual tools	Note
2	4		Volcanoes	Direct teaching and visual tools	Note
3	4		Earthquakes	Direct teaching and visual tools	Note
4	4		Stream Flooding	Direct teaching and visual tools	Quiz
5	4		First Exam		
6	4		Water Quality	Direct teaching and visual tools	Note
7	4		Water Quality	Direct teaching and visual tools	Note
8	4		Coastal areas	Direct teaching and visual tools	Note
9	4		Desertification	Direct teaching and visual tools	Quiz
10	4		Second Exam		
11	4		Global Climate	Direct teaching and visual tools	Note
12	4		Global Climate	Direct teaching and visual tools	Note
13	4		Fossil Fuel 1	Direct teaching and visual tools	Note
14	4		Fossil Fuel 2 and 3	Direct teaching and visual tools	Quiz

		degradation and desertification. 19- Define and explain Earth systems concepts relating to global change such as greenhouse gases and ozone balance. 20- Demonstrate the ability to utilize Global Positioning Systems and GIS technology 21- Discuss environmental effects of resource extraction and laws governing remediation of these effects.			
15	4	Final Course Exam			

207. Course Evaluation
17 theoretical + 8 (attendance, seminar, reports)= 25 + 50 final course exam = 100

208. Learning and Teaching Resources	
Required textbooks (curricu books, if any)	- Montgomery CW. 2008, Environmental Geology, McGraw-Hill, (9th ed.), 561p.
Main references (sources)	- Keller EA. 2007, Introduction to Environmental Geology, Pearson prentice Hall, 657p.
Recommended books and references (scientific journals, reports...)	- Journal of Geology and mining. - Journal of Geoarabia.
Electronic References, Website	https://nsufl.libguides.com/envs3000/websites

Course Description Form

209.	Course Name: **Environmental Pollution**
210.	Course Code: **GEO-423**
211.	Semester / Year: **Semester**
212.	Description Preparation Date: **2024/ 3/ 20**
213.	Available Attendance Forms: **Attendance**
214.	Number of Credit Hours (Total) / Number of Units (Total): **60/ 3**
215.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Kareem Khwedim** Email: **kkhwedim@uodiyala.edu.iq**	
216.	Course Objectives

Course Objectives	Students will learn how to: **40. assess pollution sources.** **41. study exposure pathways and fate.** **42. evaluate consequences of human exposure to pollution and impacts to environmental quality.**

217.	Teaching and Learning Strategies
Strategy	Create discussions for your students, where they can put their knowledge into practice, develop their own views on classroom content, and consolidate what they've learned. Every student has a voice - there's no talking over each other, and students have the space to explore arguments at their own pace. Encourages students to work together to find the best way to express each idea.

218. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Students will be able to: Explain how perceptions of environmental problems, the problems themselves, and the proposed solutions are shaped by their historical,	Introduction	Direct teaching and visual tools	Note
2	4		Water Pollution	Direct teaching and visual tools	Note

3	4	geographical, social, political, economic, and cultural contexts.	Water Analysis	Direct teaching and visual tools	Note
4	4		Water Analysis	Direct teaching and visual tools	Quiz
5	4		First Exam		
6	4		Radioactive Pollution	Direct teaching and visual tools	Note
7	4		Radioactive Pollution	Direct teaching and visual tools	Note
8	4		Heavy Metals	Direct teaching and visual tools	Note
9	4		Petroleum Pollution	Direct teaching and visual tools	Quiz
10	4		Second Exam		
11	4		Air Pollution	Direct teaching and visual tools	Note
12	4		Soil Pollution	Direct teaching and visual tools	Note
13	4		Soil Pollution (Biological aspects)	Direct teaching and visual tools	Note
14	4		Climatic Changes	Direct teaching and visual tools	Quiz
15	4	Final Course Exam			

219. Course Evaluation

10 theoretical + 10 Practical + 5 (attendance, seminar, reports)= 25 + 25 final course exam = 50

220. Learning and Teaching Resources	
Required textbooks (curricu books, if any)	- Der Perk M.V. (2007), Soil and Water Contamination (from molecular to catchment scale), Taylor and Francis Group, 389p.
Main references (sources)	- Peirce JJ, Weiner RF., Vesilind PV. 1997, Environmental pollution and control, 4TH Edition, Elsevier Science and Technology Books, 381p.
Recommended books and references (scientific journals, reports...)	- Journal of Geology and mining. - Journal of Geoarabia.
Electronic References, Website	http/18-The-Impact-of-Pollution-on-Our-Planet-and-Our-Lives.pdf

Course Description Form

221.	Course Name: **Ore and Industrial Minerals**
222.	Course Code: **GEO47042**
223.	Semester / Year: **Year**
224.	Description Preparation Date: **2024/ 3/ 20**
225.	Available Attendance Forms: **Attendance**
226.	Number of Credit Hours (Total) / Number of Units (Total): **125**/**5**
227.	Course administrator's name (mention all, if more than one name)
Name: **Abdulqader adnan khalaf** Email: **abdulkader@ uodiyala.edu.iq**	
228.	Course Objectives
Course Objective	The objective is to enable students after completion of the course to: 1) Describe the principles of different areas of geometallurgy (ore geology, process mineralogy, minerals processing, modelling and simulation) and how they are linked in a geometallurgical concept. 2) Use different research and analytical methods of importance for geometallurgy and interpret the results. 3) Evaluate, analyze and interpret the geometallurgical data in a quantitative way. 4) Design a geometallurgical sampling, analysis and research campaign. 5) Design a geometallurgical program.
229.	Teaching and Learning Strategies
Strategy	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials.
230. Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Above listed ILOs cover the EIT Overarching Learning Outcomes: 1, 4, 5 and 6: Linking ore geology, mineral processing and simulation for data treatment customization contributes to making value judgements and developing sustainability competencies. By constructing a model with different types of geological and metallurgical data for simulation and prediction, the research skills and competencies are trained. Intellectual transforming skills and competencies are taught in group projects by solving possible realistic processing problems. Through integration of multiple data and process models for resource efficiency optimization, the innovation skills and competencies are addressed.	**Introduction of Ore Geology**	Direct teaching and visual tools	Note
2	4		**Some definitions related to ore geology**	Direct teaching and visual tools	Note
3	4		**Types of ore minerals**	Direct teaching and visual tools	Note
4	4		**Classifications of ore deposits**	Direct teaching and visual tools	Quiz
5	4		**First Exam**		
6	4		**Ore Forming Processes**	Direct teaching and visual tools	Note
7	4		**Ore Forming Fluids**	Direct teaching and visual tools	Note
8	4		**Morphology of Ore Deposits**	Direct teaching and visual tools	Note
9	4		**Importance of ore minerals in society and the global economy**	Direct teaching and visual tools	Quiz
10	4		Second Exam		
11	4		**Basic characteristics and properties of ore minerals**	Direct teaching and visual tools	Note
12	4		**Classification based on composition**	Direct teaching and visual tools	Note
13	4		**Classification based on mode of occurrence**	Direct teaching and visual tools	Note
14	4		**Classification based on economic significance**	Direct teaching	Quiz

				and visual tools	
15	4		**Classification of ore minerals**	Direct teaching and visual tools	Note
16	4		**Introduction of Industrial minerals**.	Direct teaching and visual tools	Note
17	4		**Importance of non metallic**	Direct teaching and visual tools	Note
18	4		**Bates Classification**	Direct teaching and visual tools	Quiz
19	4		**Industrial Basalt and Diabase**	Direct teaching and visual tools	Note
20	4		**First Exam**		
21	4		**Metamorphic rocks**	Direct teaching and visual tools	Note
22	4		**Industrial sedimentary rocks**	Direct teaching and visual tools	Quiz
23	4		**Industrial limestone and dolomite**	Direct teaching and visual tools	Note
24	4		**Clay**	Direct teaching and visual tools	Note
25	4		**Second Exam**		
26	4		**Gypsum**	Direct teaching and visual tools	Quiz
27	4		**Industrial phosphates rocks**	Direct teaching and visual tools	Note

28	4		**Cement Industrial**	Direct teaching and visual tools	Note
29	4		**Importance of ore minerals in the economy and industry**	Direct teaching and visual tools	Note
30	4	**Final Course Exam**			

231. Course Evaluation

30 theoretical + 15 practical + 5 (attendance, seminar, reports)= 50 + 50 final course exam = 100

232. Learning and Teaching Resources

Required textbooks (curricu books, if any)	-
Main references (sources)	1- Almond.D.CandWhitlen. D.A.(1996):Rocks. Minerals and Crystals.128P Hamyln.London 2- Tyrrell. F.G. (2005): Petrology . 480P.Mc Graw Hill.N.Y
Recommended books and references (scientific journals, reports...)	- مجلة الجيولوجيا و التعدين Journal of Geoarabia.
Electronic References, Website	

Course Description Form

233. Course Name: Mining Geology	
234. Course Code: GEMG 408	
235. Semester / Year: Year	
236. Description Preparation Date: 20-7-2023	
237. Available Attendance Forms: Mandatory	
238. Number of Credit Hours (Total) / Number of Units (Total): 120 hour/6 units	
239. Course administrator's name (mention all, if more than one name)	
Name: Prof. Dr. Asem Ahmed Hassan Email: asem.ahmed@uodiyala.edu.iq	
240. Course Objectives	
Course Objectives	To gain knowledge about: 43. The basics of Mining Geology as one of the Geology branches. 44. Importance of Mining Geology and Applications 45. The role of a mine geologist. 46. The role and career paths of a Mining Geologist. 47. The basic mining terminologies, mining stages, and Operations 48. Environmental impacts of surface and subsurface mining. **49**. Surface mining and subsurface mining methods Quarries and methods of quarrying
241. Teaching and Learning Strategies	
Strategy	The main strategy that will be adopted in delivering this course is to encourage students to participate in the lectures and exercises and expand their thinking skills. Students will learn the basic concepts of Mining Geology in lectures and apply these concepts in practical classes involving lab experiments and exercises.

242. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	**4**	**Define the basics of Mining Geology and mining terminologies**	**Introduction to Mining Geology**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
2	**4**	**Classify the mineral deposits based on their Genesis, form, geological setting, etc.**	**Classification of Mineral deposits**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
3	**4**	**Explain the stages in the life cycle of a mine**	**Mining Cycle**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
4	**4**	**Learn the main principles of mineral exploration, goals, stages, etc.**	**Mineral Exploration**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
5	**4**	**Use of remote sensing methods for mineral exploration**	**Remote Sensing**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
6	**4**	**Learn the basics of using geophysical methods (gravity and magnetic) for mineral prospecting**	**Geophysical prospecting 1**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**

7	**4**	**Learn the basics of using geophysical methods (seismic, Resistivity, Radar, Airborn) for mineral prospecting**	**Geophysical prospecting 2**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
8	**4**	**-**	**Exam**	**-**	**Monthly exam**
9	**4**	**Explain the basics and types of geochemical exploration methods**	**Geochemical exploration 1**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
10	**4**	**Design of Geochemical survey and stages**	**Geochemical exploration 2**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
11	**4**	**Use drilling methods in mineral exploration**	**Drilling**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
12	**4**	**Learn sampling methods used for mineral exploration**	**Sampling**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
13	**4**	**Explain sampling patterns for mineral exploration**	**Sampling patterns**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
14	**4**	**Learn the basics and tools of the geological survey in Mineral exploration**	**Geological survey**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
15	**4**	**-**	**Exam**		**Monthly exam**
16	**4**	**Learn the basics of mining methods and factors influencing the choice of mining method**	**Mining methods**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
17	**4**	**Explain the basics of surface mining methods**	**Surface Mining**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**
18	**4**	**Learn the extraction techniques of mechanical extraction methods**	**Mechanical Extraction Methods**	**Direct lecture Question and ansv Data show**	**Homeworks quizzes reports**

19	**4**	**Learn the extraction techniques of Aqueous Extraction Methods**	**Aqueous Extraction Methods**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
20	**4**	**Explain the basics of surface mining methods**	**Subsurface Mining**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
21	**4**	**Learn the principles of mining of unsupported mining methods**	**Unsupported mining methods**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
22	**4**	**Learn the principles of mining of supported mining methods**	**Supported mining methods**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
23	**4**	**-**	**Exam**	**-**	**Monthly exan**
24	**4**	**Understand the basics of quarrying**	**Introduction to quarries**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
25	**4**	**Learn the methods used for quarrying**	**Methods of quarrying**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
26	**4**	**Explain the basics of mineral processing**	**Mineral processing**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
27	**4**	**Learn the stages of mineral processing**	**Stages of mineral processing**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
28	**4**	**Explain the basics of Physical processing methods**	**Physical mineral processing**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
29	**4**	**Explain the basics of chemical processing methods**	**Chemical mineral processing**	**Direct lecture Question and answ Data show**	**Homeworks quizzes reports**
30	**4**	**-**	**Exam**	**-**	**Monthly exan**

243. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc	
244. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	1. Evans, A.M. 1986. An introduction to ore geology, Blackwell scientific publications. P230. 2. Moon, C. J., Whateley, M.K.C. and Evans, A.M. 2006. introduction to mineral exploration, Blackwell publishing, P. 481. 3. Stocks, J. and Down, C., 1980. Mining and Mineral processing, Open University Press, P.
Recommended books and references (scientific journals, reports…)	1. Iraqi Bulletin of Geology and Mining 2. Geology and mining research
Electronic References, Websites	https://ibgm-iq.org/ https://www.pngminers.com/

Course Description Form

245. Course Name: Petroleum Software	
246. Course Code: GEPS407	
247. Semester / Year: Year	
248. Description Preparation Date: 20-7-2023	
249. Available Attendance Forms: Mandatory	
250. Number of Credit Hours (Total) / Number of Units (Total): 120 hour/6 units	
251. Course administrator's name (mention all, if more than one name)	
Name: Prof. Dr. Asem Ahmed Hassan Email: asem.ahmed@uodiyala.edu.iq	
252. Course Objectives	
Course Objectives	To gain knowledge about: 50. The basics of some petroleum and geologic software. 51. Using SedLog software for creating graphic sediment logs 52. Plotting different maps using Surfer software. 53. Application of IPI2win for interpretation of vertical electrical sounding. 54. Using petroleum and geologic software for the preparation of reports and articles.
253. Teaching and Learning Strategies	
Strategy	The main strategy that will be adopted in delivering this course is to encourage students to participate in the lectures and exercises and expand their thinking skills. Students will learn the basic concepts of Petroleum software in lectures and apply these concepts in practical classes and exercises.

254. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	**4**	**Learn the basics of SedLog software and its applications**	**Introduction to SedLog**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
2	**4**	**Learn the main components of SedLog home screen**	**The home screen of SedLog software**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
3	**4**	**Use the main commands for data input in SedLog**	**Data input in SedLog**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
4	**4**	**Learn how to customize the graphic log**	**Graphic log customization**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
5	**4**	**Practice how to create Lithologies/symbols**	**Create Lithologies/symbols**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
6	**4**	**Learn how to create templates and data export**	**Templates**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
7	**4**	**Practice plotting the Sedemintry logs**	**Practice on plotting the Sedemintry logs**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
8	**4**	**-**	**Exam**	**-**	**Monthly exam**
9	**4**	**Learn the basics of Surfer software**	**Introduction to Surfer**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
10	**4**	**Learn the main components of the home screen of Surfer**	**Home screen of Surfer**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
11	**4**	**Practice to create XYZ data file**	**Creating XYZ data file**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**

12	**4**	**Practice to create Grid data**	**Creating Grid file**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
13	**4**	**Learn how to create contour maps**	**Contour maps**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
14	**4**	**Change properties of the contour maps**	**Contour maps properties 1**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
15	**4**	**-**	**Exam**		**Monthly exan**
16	**4**	**Change properties of the contour maps**	**Contour maps properties 2**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
17	**4**	**Practice creating post maps and changing their properties**	**Creating post maps**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
18	**4**	**Practice creating 3D surface maps and changing their properties**	**Creating 3D surface maps**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
19	**4**	**Learn to add transparency and color scales**	**Transparency and Color scales**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
20	**4**	**Explain the basics of surface mining methods**	**Adding map layers and titles**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
21	**4**	**Practice plotting different maps**	**Training 1**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
22	**4**	**Practice plotting different maps**	**Training 2**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
23	**4**	**-**	**Exam**	**-**	**Monthly exan**
24	**4**	**Understand the basics of IPI2WIN software**	**Introduction to IPI2WIN**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**

25	**4**	**Learn the theoretical principles of the electrical resistivity method**	**Principles of electrical resistivity method**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
26	**4**	**Practice the main commands to use IPI2Win**	**The main steps for using IPI2Win**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
27	**4**	**Learn to insert data in IPI2WIN**	**Data input in IPI2WIN**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
28	**4**	**Practice to interpret the data in IPI2WIN**	**Data interpretation in IPI2WIN**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
29	**4**	**Create Pseudo and Resistivity Cross Sections in IPI2WIN**	**Creating Pseudo and Resistivity cross-sections**	**Direct lecture Practical lab Data show**	**Homeworks quizzes reports**
30	**4**	**-**	**Exam**	**-**	**Monthly exa**

255. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, dailyoral, monthly, or written exams, reports .... etc

256. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	1. SedLog: A shareware program for drawing graphic logs and log data manipulation, Computers & Geosciences, Volume 35, Issue 10, Pages 2151-2159, 2009. 2. Reynolds, J. M. 1997. An introduction to applied and environmental geophysics Chichester: John Wiley & Sons
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	https://sedlog.rhul.ac.uk/download.html https://www.goldensoftware.com/products/surfer www.geotomosoft.com/coursenotes.zip

Course Description Form

257.	Course Name: **seismic exploration**
258.	Course Code: GEO48143
259.	Semester / Year: **Semester**
260.	Description Preparation Date: **2024/ 3/ 20**
261.	Available Attendance Forms: **Attendance**
262.	Number of Credit Hours (Total) / Number of Units (Total): **60/ 3**
263.	Course administrator's name (mention all, if more than one name)
Name: **Prof. Dr. Munther Dhahir** Email: **munther_hnt@uodiyala.edu.iq**	
264.	Course Objectives

Course Objective	• **The course aims to equip the student with fundamental theory, of seismic reflection methods that are used today in oil industry** • **Geological interpretation of reflection seismic data.**

11-	Teaching and Learning Strategies
Strategy	• lectures are given to transfer the course material to the student in a simple and clear way • discussion will be open at each class to help students express their thoughts and ideas, and to improve theircommunication skills • students will be given group assignments to do team and individual research work to broaden theirknowledge and put into practice the different theories and concepts covered in the lectures.

12- Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Information about principles of seismic method , seismic data acquisition , processing and interpretation	Seismic methods , Basic principles	Direct teaching and visual tools	Note
2	4		Acoustic impedance , Reflection and Transmission Coefficients	Direct teaching and visual tools	Note
3	4		Seismic data acquisition	Direct teaching and visual tools	Note
4	4		Seismic Receivers , spread layout or receiver distribution	Direct teaching and visual tools	Quiz
5	4		Recording system		Note
6	4		Design of field Parameters, ACQUISITION PARAMETERS	Direct teaching and visual tools	Note
7	4		First month exam		
8	4		Seismic Noise , signal and noise , types of noise , Filtering	Direct teaching and visual tools	Note
9	4		The Well Velocity Survey	Direct teaching and visual tools	Quiz
10	4		Seismic data processing		
11	4		Seismic data processing	Direct teaching and visual tools	Note
12	4		Seismic data interpretation	Direct teaching and visual tools	Note
13	4		Structural seismic interpretation	Direct teaching and visual tools	Note

14	4		Strati graphical seismic interpretation	Direct teaching and visual tools	Quiz
15	4	Second month exam			

13- Course Evaluation	
10 theoretical + 10 practical + 5 (attendance, seminar, reports)= 25 + 50 final course exam = 100	
14- Learning and Teaching Resources	
Required textbooks (curricu books, if any)	
Main references (sources)	- Dobrin and Savit,1988,Introduction to geophysical prospecting - Kearey ,Brook,1984,An Introduction to geophysical prospecting - Parasnis,1986, Principles of applied geophysics - Reynolds , 1997,An introduction to Applied and environmental Geophysics
Recommended books and references (scientific journals, reports...)	
Electronic References, Website	