

University of Mosul جامعة الموصل



First Cycle – Bachelor's Degree (B.Sc.) - Geology
بكالوريوس – علوم الارض



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1. Overview

This catalogue is about the courses (modules) given by the program of Department of Geology to gain the Bachelor of Science degree. The program delivers (xx) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظره عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج علوم الارض للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (٤٠) مادة دراسية، على سبيل المثال، مع (٦٠٠٠) إجمالي ساعات حمل الطالب و ٢٤٠ إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

2. Undergraduate Courses 2023-2024

Module 1

Code	Course/Module Title	ECTS	Semester
GEO-1101	General Geology I	8.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	1/2	93	107
Description			
Studying the earth and the creation of the universe, and the divisions of the earth and its parts. Identifying the main elements of the earth's crust, studying minerals and their types, and methods of diagnosing them. And then the study of igneous rocks and the method of their origin and divisions. Sedimentary rocks, their types, characteristics, methods of formation, and areas of formation (depositional environments). As well as metamorphic rocks, methods of transformation, conditions of transformation and their divisions. Identify the factors affecting the weathering of rocks and methods of transporting sediments, their aggregation and cohesion.			

Module 2

Code	Course/Module Title	ECTS	Semester
GEO-1102	Crystallography	8.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	1/2	93	107

Description
The student will study and classify the crystal structure of minerals in terms of the external shape and internal structure of the crystal and the identification of minerals as well as knowledge of the internal structure of the crystals and the study of its parts, which in turn determines the crystalline system.

Module 3

Code	Course/Module Title	ECTS	Semester
GEO-1103	Chemistry	8.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	1/2	93	107
Description			
This section includes a description of the module, 100-150 words			

Module 4

Code	Course/Module Title	ECTS	Semester
Sci-101	Mathematic	2.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	1	33	17
Description			
This section includes a description of the module, 100-150 words			

Module 5

Code	Course/Module Title	ECTS	Semester
UOM-104	Democracy & Human Right	2.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/w)
2	1	33	17
Description			
This section includes a description of the module, 100-150 words			

Module 6

Code	Course/Module Title	ECTS	Semester
UOM-101	Arabic Language	2.00	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	33	17
Description			
This section includes a description of the module, 100-150 words			

Model 7

Code	Course/Module Title	ECTS	Semester
GEO-1214	General Geology II	8.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	93	107
Description			
<p>The study aims to introduce students in the first stage to the science of geology and all its branches and specializations. This is done by giving preliminary introductory lectures in a simplified and in-depth manner to all the disciplines that the student will learn in the coming stages, so that he will be prepared later to delve deeper into those disciplines when he learns them in the future. Students will be taught structural geology, surface and groundwater science. And take an important look at the theory of plate tectonics. Introducing students to historical geology and the most important rules adopted in determining geological time in both its relative and absolute types, the geological time scale and stratigraphy with its main lines</p>			

Model 8

Code	Course/Module Title	ECTS	Semester
GEO-1205	Mineralogy	8.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	93	107
Description			
<p>The course includes the principles of mineralogy and the study of the chemical and physical properties of the various minerals, as well as the study of the classification and chemical composition of minerals. The course also includes the economic importance of minerals and their distribution in different types of rocks and sediments. In a practical course, the students describe the minerals with hand specimens and a description of the physical and other properties of minerals to reach the correct name of the mineral, leading to the development of the student's skills to characterize all types of minerals and distinguish them by properties.</p>			

Module 9

Code	Course/Module Title	ECTS	Semester
GEO-1206	Physics	7.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	93	82
Description			
This section includes a description of the module, 100-150 words			

Module 10

Code	Course/Module Title	ECTS	Semester
GEO-1207	Statistics	2.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	33	17
Description			
This section includes a description of the module, 100-150 words			

Module 11

Code	Course/Module Title	ECTS	Semester
UOM-103	Computer	3.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	73	12
Description			
<p>This program is meant for those students who have low-level literacy in computer use and only partial understanding of the functions of a computer. And so, the students are introduced to this program to improve computer literacy. The students must apply their knowledge to use office skills before use the advanced geology software.</p> <ul style="list-style-type: none"> - Describe why computers are important. - Explain how computers work. - Explain the difference between computer hardware and computer software. - Describe what an operating system is. - Identify the operating system you have on your own computer and phone. - Explain office productivity and communications software. - Start up and shut down computers properly. - Use the mouse and keyboard to complete tasks on the computer. - Identify the different groups of keys on the computer. - Create, open, save, and manage files and folders 			

Module 12

Code	Course/Module Title	ECTS	Semester
UOM-102	English Language	۲.00	2
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	۳۳	17
Description			
This section includes a description of the module, 100-150 words			

Module 13

Code	Course/Module Title	ECTS	Semester
GEO-2318	Optical Mineralogy	6.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	108	42
Description			
<p>Optical Mineralogy includes a wide range of basic and advanced fundamentals knowledge . 1. - Definition of all terms related to light and the most important hypotheses that explained the different light phenomena.</p> <p>2. Explain the difference between the types of light (polarized, normal, monochromatic, etc.) and how to obtain each one of them.</p> <p>3. Summarize what is meant by uniaxial indicatrix, biaxial indicatrix and isotropic indicatrix .</p> <p>4- Discuss & explain the process of double refraction in detail and how to benefit from it practically, and how refractive index</p> <p>5---Explain the parts of the polarizing microscope, its working mechanism, and how to make maximum use of it in the study of minerals and rocks</p>			

Module 14

Code	Course/Module Title	ECTS	Semester
GEO-2309	Paleontology	6.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	72
Description			
<p>The description includes two parts: Part A include the theoretical topics:</p> <p>Introduction, organisms groups , types of fossils, taxonomic position , general characteristic of Ostracoda, importance of Ostracoda study (as fossils), morphology of Echinod, Echinod parts , description of margins, features and structures used for the orientation of the shell, external feature, internal features, terminology of Echinod, dimorphism.</p> <p>Ecology, distribution of marine Echinod, factors controlled of the distribution of Echinod, distribution</p>			

of environments according to the salinity levels, Paleoecology.
coccolithophores, trilobite , graptolite morphology and formation.
Ecology of Echinod, functions of shell, geologic distribution, effect of marine change on distribution,
evolutionary responses, terminology of Echinoid.

Revision problem classes

Part B – Practical labs

Shape, measurements of shell and parts, orientation, features, external structures, internal structures,
ornamentation, description of some index species.

graptolite shape, Echinoid orientation, Echinoid size, ultrastructural component, element
arrangement, orientation in plain view, crystallography, systematic paleontology, description of some
index species.

Module 15

Code	Course/Module Title	ECTS	Semester
GEO-23010	Sedimentology	5.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
<ol style="list-style-type: none"> The student will understand the nature of sedimentary materials. The students will be able to describe the shapes, sizes, fabric and porosity of sedimentary rocks. The students will be able to will be able to understand how sedimentary rocks originate through a set of processes that begins with weathering, transportation and deposition The students will be able to will be able to understand the processes of transportation, deposition and formation of sedimentary structures. The students will be able to understand the origin of sedimentary structures. The students will be able to classify the different types of sedimentary structures. <p>The students will be able will be able to understand the processes of transportation, deposition and formation of sedimentary structures</p>			

Module 16

Code	Course/Module Title	ECTS	Semester
UOM- 201	Crimes of the defunct Baath Party	2.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	33	17
Description			
<p>Part A – Theoretical lectures Surfer Software</p> <p>Understand the basic concepts of GIS</p> <p>Raster, vector, projections, geoprocessing and analysis</p> <p>Use a GIS for basic skills in:</p>			

Thematic mapping
 Importing tabular data and GIS interpolation
 Basic vector data analysis
 Finding and using Open Access data
 Styling and Map Design

Part A Theoretical lectures ArcGIS Software.

Edit Data from the Map Layer, Attribute Table, View Hyperlink, Track all, Group, Ungroup, Points to Polyline, Points to 3D Polyline, Polygon to Polyline, Polygon to 3D Polygon, Polyline to Points, Polyline to Polygon, Polyline to 3D Polyline, Reshape
 Thin, Smooth, Crop Image, Connect Polylines, Break Polyline, Break Polyline at Intersections, Alpha Shape, Union Polygons, Intersect Polygons, Difference of Polygons, Buffer, Create Intersection Points
 Triangulation, Thiessen Polygons.

Part B Practice or Lab:

Applying the practical training by building and developing the model by using surfer and ArcGIS map application

Module 17

Code	Course/Module Title	ECTS	Semester
GEO-23011	petrology	6.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	72

Description

Module description includes the following.

Part A – Theoretical lectures

The Principal Subdivisions of the Earth's Interior, Types of rocks, rock cycle, Igneous rocks, Classifications of igneous rocks, Chemical Composition of Igneous Rocks, Chemical Effect on the Mineral Composition, Mineralogical classifications, Grain Size and Occurrence, Discuss the Bowen 's reaction series and description of the most common rocks.

Metamorphism, Factors Controlling Metamorphism, Types of Metamorphism, Grade of Metamorphism, Metamorphic Zones, Mineral assemblage, Metamorphic facies.

Advantages of sedimentary rocks, General classification of sedimentary rocks, Clastic rocks/ Sandstones, Conglomerate and shale, Chemical–Biochemical Rocks/ Carbonate rocks, Evaporites rocks, Other Chemical–Biochemical Rocks/ chert rocks, phosphorites, organic rocks, others.

Revision problem classes

Part B – Practical labs

Igneous Rocks (Introduction), Acidic Igneous Rocks, Intermediate Igneous Rocks, Basic Igneous Rocks, Ultrabasic Igneous Rocks.

Metamorphic Rocks (Introduction), Metamorphic Rocks (Non-foliated rocks), Metamorphic Rocks (Foliated rocks).

Clastic rocks/Sandstones, Clastic rocks/Conglomerate and shale, Chemical–Biochemical Rocks/Carbonate rocks, Chemical –Biochemical Rocks/Evaporites rocks, Other Chemical –Biochemical Rocks/ chert rocks, phosphorites, organic rocks, others.

Module 18

Code	Course/Module Title	ECTS	Semester
GEO-23012	Geomorphology	5.00	3
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	63	62
Description			
This section includes a description of the module, 100-150 words			

Module 19

Code	Course/Module Title	ECTS	Semester
GEO-24013	Igneous Petrology	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	78	47
Description			
<p>Indicative content includes the following.</p> <p>Part A – Theoretical lectures Introduction, The Principal Subdivisions of the Earth's Interior, crust, mantle, core, Pyrolite Model, Forms and Structures of Intrusive Rocks such as Dykes, Sills, Batholiths, and Ophiolite Complexes, Tectonite peridotite rocks, Cumulated Rocks, Classification of Igneous Rocks, Chemical Classification, Chemical Effect on the Mineral Composition, Mineralogical classifications, textural classification. Magmatic Differentiation, Partial Melting, Bowen's Reaction Series, Crystal fractionation, Petrogenesis, Magma Generation, Mechanism of melting, Generation of Basaltic Magma, Generation of Granitic Magma. Tectonic Setting and Conclusions of Basaltic and Granitic Rocks, Plate Tectonics, Plate boundaries or margins, Tectonic Environments, Oceanic Igneous Rocks. Physical Chemistry and Physical Properties of the Synthetic Magmas, Phase Rule, Phase diagram, One Component (Unary) Systems, Two Components (Binary) Systems, Three Components (Ternary) Systems, Four Components (Quaternary) Systems. Revision problem classes</p> <p>Part B – Practical labs Introduction of Igneous Rocks, Diagnostic features of igneous minerals by the microscope, Textures of Igneous Rocks, Classification of Igneous Rocks, Acidic Igneous, Types of Acidic Igneous Rocks. Intermediate Igneous Rocks, Types of Intermediate Igneous Rocks, Basic Igneous Rocks, Types of Basic Igneous Rocks, Ultrabasic Igneous Rocks, Types of Ultrabasic Igneous Rocks.</p>			

Module 20

Code	Course/Module Title	ECTS	Semester
GEO-24014	Micropaleontology I	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	78	47
Description			
<p>This module includes the following.</p> <p>Part A – Theoretical lectures Introduction, Micropaleontology, scientific terms, Binomial Nomenclature, the kingdom of live, living foraminifera, life cycle of foraminifera, the description the test of foraminifera, classification . Geological history foraminifera, Ecology of foraminifera, Application of foraminifera. Organic Microfossils, Definition, types, applications. spores & pollen grains (definition, life cycle, life cycle, affinity, production, morphological characters, wall composition, classification, Distribution, Evolutionary trends & Historical geology). (8hrs) 10-Acritarch group: morphology, affinity, classification, historical geology, ecology 11-Chitinozoa group: morphology, life cycle, affinity, classification, historical geology, ecology. 12-Dionflagellates group: morphology, life cycle, affinity, classification, historical geology, ecology. Indicative content includes the following. Revision problem classes.</p> <p>Part B – Practical labs Composition and microstructure of the wall, chambers test shape and chamber arrangement, aperture, suture line, ornamentation, periphery of test, umbilical characters. Spores & pollen grains (, types, morphology, symmetry, wall types, laesurae types, ornamentation, classification) Acritarchs (, types, morphology, wall types, pylome types, classification) Chitinozoa (morphology, wall types, basal margin structure types, classification)</p>			

Module 21

Code	Course/Module Title	ECTS	Semester
GEO-24015	Sedimentary Petrology	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	78	47
Description			
<p>This description includes the following.</p> <p>Introduction, Particle composition. Major Minerals, Quartz, Feldspars, Coarse Mica, Clay minerals, Heavy minerals, Rock fragments, Mineral Cements, Matrix Minerals, sandstones maturity, Classification of sandstones, Classification of epiclastic sandstone, Petrography and chemistry of</p>			

sandstones, Quartz arenites, Feldspathic arenites, Lithic arenites. Other sandstones. [10 hrs]
 Gravels, Conglomerates, and Breccias, Composition of framework clasts, Composition of matrix and cements, Sedimentary structures in conglomerates, classification of conglomerates, General statement, Classification by relative clast stability, Classification by clast lithology, Classification by clast size, extraformational (terrigenous gravel) conglomerates and breccias, Orthoconglomerates, Paraconglomerates (Conglomeratic Mudstone), Intraformational Conglomerates and Breccias . [8 hrs]
 Shale (Mudstone), composition, chemical composition, classification, origin of shale, diagenesis of siliciclastic sedimentary rocks, eogenesis, mesogenesis, telogenesis. [10 hrs].
 Siliceous sedimentary rocks (cherts) , Mineralogy and texture, Principal kinds of cherts, Bedded and nodular chert, Deposition of chert , Precipitation of chert from seawater, Biogenic removal of silica, Nonbiogenic cherts, Replacement chert.
 Carbonate sedimentary rocks, Limestone, Introduction, Mineralogy
 Major components of limestones, Identification of carbonate minerals, Noncarbonate components
 Carbonate grains, Peloids, coated grains, Lithoclasts,
 Skeletal grains (bioclasts), Microcrystalline carbonate (lime mud), Sparry calcite
 Classification of carbonate rocks, Folk's classification (1962), Dunham's classification (1962).\n
 Nonmarine carbonates, Lacustrine carbonates, Carbonates in rivers, streams, and springs, Caliche (calcrete) carbonates,
 Dolomites, Introduction, Mineralogy of dolomites, Dolomite textures, Origin of dolomite.
 Diagenesis of carbonate rocks, Introduction, Biogenic Alteration, Cementation, Dissolution, Neomorphism, Replacement
 Evaporites, Introduction, Gypsum and Anhydrite, Nodular anhydrites, Laminated anhydrites, Massive anhydrite, Halite.
 Origin of Evaporite Deposits, Depositional Models for Evaporites.

Module 22

Code	Course/Module Title	ECTS	Semester
GEO-24016	Metamorphic petrology	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	78	47
Description			
This section includes a description of the module, 100-150 words			

Module 23

Code	Course/Module Title	ECTS	Semester
GEO-24117	Invertebrates Paleontology	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	63	62
Description			
content includes the following.			

<p>Part A – Theoretical lectures Introduction , Metamorphism Factors of metamorphism Geothermal gradient Prograde metamorphism Retrograde metamorphism 18hrs Type of metamorphism Local metamorphism Regional metamorphism Grade of metamorphism Index minerals Isograds 18hrs, Phase rule Univariant system Bivariant System Mineral assemblage Types of metamorphism reactions 18hrs Triangular diagrams Metamorphic facies 12hrs</p> <p>Part B – Practical labs Introduction of Metamorphic rocks METAMORPHIC MINERALS. 3hrs CONTACT (THERMAL) METAMORPHISM. Description of the rock slides for contact metamorphic rocks First Quiz 6hrs DYNAMIC METAMORPHISM Description of the rock slides for dynamic metamorphic rocks 6hrs REGIONAL METAMORPHISM (BARROVIAN-TYPE) Description of the rock slides for regional metamorphic rocks Second</p>

Module 24

Code	Course/Module Title	ECTS	Semester
GEO-35018	Remote sensing	5.00	4
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	63	62
Description			
<p>Part A – Theoretical lectures Introduction to remote sensing, Principles of remote sensing, Electromagnetic wavelength and spectral signature ,Aerial photography, Visual interpretation ,Remote sensing satellites, Image processing and Interpretation ,Geographical Information System</p> <p>Part B – Practical labs Introduction to remote sensing., Visual interpretation elements. Instruments of remote sensing. Mirror stereoscope and Stereoscopic. Practical work, Global mapper technique, Mapping by using classic and digital</p>			

Module 25

Code	Course/Module Title	ECTS	Semester
GEO-24019	Structural Geology I	5.00	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	78	47
Description			

Module 26

Code	Course/Module Title	ECTS	Semester
GEO-35020	Geotectonic	5.00	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
This section includes a description of the module, 100-150 words			

Module 27

Code	Course/Module Title	ECTS	Semester
GEO-35021	Gravity & magnetic method	5	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
<p>Part A – gravity Introduction, Geophysics definition, types of Geophysics methods, Gravity definition , important of gravity method in our life , general characteristic of gravity methods and the basic theoretical principles of gravity method, importance of gravity interpretation, Units of gravity, geological feature affecting to density of rock, measuring gravity, gravity method technique, gravity data corrections ,local and regional anomaly, the ambiguity of sub-surface gravity anomaly, interpretation of gravity data .</p> <p>Part B- Magnetic method Introduction of magnetic methods, basic principles of magnetic method and theoretical principles, Units and earth magnetic field, rock magnetism measure of magnetic field, magnetic survey, correction of magnetic observation, magnetic anomaly, magnetic data interpretation.</p>			

Module 28

Code	Course/Module Title	ECTS	Semester
GEO-35022	Geochemistry	5.00	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	63	62
Description			
Introduction, construction of the earth , Earth's Interior , Seismic data on the earth's interior , Density			

Distribution , Heat and Pressure Distribution , Material of earth interior , Rocks of Deep Origin : Ophiolite Complexes , Diamond bearing Kimberlite Pipes , Xenolith . , Experimental Studies , Earth Crust , The chemical composition of the Earth Crust. [10 hrs]

Material of The Mantle , Material of the Upper Mantle , Transition Zone of Earth Mantle, Lower Mantle Material , Outer Core , Inner Core, Meteorite , Geochemical Classification of Elements . [8 hrs]

Geochemistry of supergene environment , Hypogene Environment , Geochemistry of Sediment and Sedimentary Rocks , Weathering , Physical weathering , Chemical weathering , Chemical weathering reactions, Weathering products , Factors controlling the behavior of elements in sedimentary environments , Ionic potential for elements , Power (Potential) of hydrogen (pH) , Oxidation-reduction (redox) potential

Module 29

Code	Course/Module Title	ECTS	Semester
GEO-35023	Stratigraphy	5.00	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	63	62
Description			
Introduction, principle of correlation. Correlation of Stratigraphy, methods of rock correlation, biostratigraphy units, time Stratigraphy units, element and FACTORS, classification of sedimentary Environments, continental env. Terrestrial env., aqueous env. Marine env			

Module 30

Code	Course/Module Title	ECTS	Semester
GEO-35124	Micropaleontology II	5.00	5
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
Introduction, organisms groups , types of microfossils, taxonomic position , general characteristic of ostracoda, importance of ostracoda study (as microfossils), morphology of ostracoda, calcareous parts , outer lamella, inner lamella, description of margins, features and structures used for the orientation of the carapace, external feature, internal features, ornamentation, terminology of ostracode, dimorphism. [10 hrs]			
Ecology, distribution of marine ostracoda, factors controlled of the distribution of ostracoda, distribution of environments according to the salinity levels, Paleoecology			

Module 31

Code	Course/Module Title	ECTS	Semester
GEO-36125	Structural Geology II	6.00	6

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	78	72
Description			
Introduction to geological structures, genetic and geometric classification of joints. Attitude of joints , joints in the field, academic and economic importance of joints, faults types and various classifications modes, field criteria of faults, faults and it relation with principal stress axes. Balance cross section concept and measure of shortening ratio.			

Module 32

Code	Course/Module Title	ECTS	Semester
GEO-36026	Field Geology	5.00	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
Introduction to field geology. Outline and Approach of Field Behavior. Relation with other geosciences. Types of Geological maps and Base Maps. Methods of Position Finding on Maps. Methods of geological mapping. Traversing types-controlling traverse. Description rocks in the field. Determination of top of beds by sedimentary structures. Descriptive fold elements in the field			

Module 33

Code	Course/Module Title	ECTS	Semester
GEO-36027	Basin analysis and Sequence Stratigraphy	5.00	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
1- Preface and introduction, Aims of basins analysis study, Sedimentary basin concept. 2- Mechanisms of basin formation, Basin plains, Vertical and horizontal basin zonation 3- Controls on sediment accumulation, Tectonic setting classification of sedimentary basins 4- basins related to lithospheric extension (divergent) 5- basins related to subduction (convergent) 6- basins related to strike slip tectonics. 7- basins related to crustal loading, complex and hybrid basins, the record of tectonics in stratigraphy. 8- Concepts and principles of sequence stratigraphy 9- Basin- margin concepts 10- Definitions of sea- level, Accommodation, sediment supply, Orders of cyclicity 11- Basin architecture (Progradation, Retrogradation, aggradation)			

- 12- sequence boundaries and their correlative conformities
- 13- Systems tract definition
- 14- Sequence stratigraphy of wireline logs

Module 34

Code	Course/Module Title	ECTS	Semester
GEO-36028	Sedimentary environments	6.00	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/3	78	72
Description			
<p>Introduction to sedimentary environments - Classification of sedimentary environments Facies and Facies models, marine or nonmarine?, marine fossils, carbonate rocks, red beds, evaporite chemistry. Continental or terrestrial environments, Introduction, Fluvial systems, Alluvial fans, Sedimentary processes on fans. River systems, Channel form, Sediment Transport Processes in River, Floodplain Deposition, Characteristics of Fluvial Deposits, Palaeosols, How do you know it's Fluvial? Eolian Desert systems, Introduction, Global wind patterns, desert environment, Life in deserts, Characteristics of Aeolian deposits Lakes Environments, Introduction, Lake formation, Lake hydrology, freshwater Laks, Deep lake facies. Saline lakes, Life in Lakes, Characteristics of lake deposits. The Marine Realm: Morphology and Processes, Introduction, Divisions of the marine realm, Deltas Environment, Introduction, Classification of deltas, Fluvial-Dominated Deltas, Tide-Dominated Deltas, Wave-Dominated Deltas, Fan Deltas, Delta Cycles, Characteristics of deltaic deposits</p>			

Module 35

Code	Course/Module Title	ECTS	Semester
GEO-36029	Geology of Iraq	5.00	6
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	3	78	47
Description			
<p>Introduction, Some Basic Information on the Position and Structure of Iraq, boundaries of Arabian plate, Tectonic Divisions of Iraq according to Jassim and Goff (2006), Stable shelf Units, Unstable shelf Units, Zagros suture Units, Development of Arabian Plate, Margins of Arabian plate, Tectonostratigraphic megasequence: TMS, TMS Ap1, TMS Ap2, TMS Ap3, paleogeography in Early Paleozoic, TMS Ap4, TMS Ap5, Active Margin And Back-Arc Basin</p>			

Module 36

Code	Course/Module Title	ECTS	Semester
GEO-36030	Methodology	3.00	6

Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1	48	27
Description			
This section includes a description of the module, 100-150 words			

Module 37

Code	Course/Module Title	ECTS	Semester
GEO-47031	Geological Field	6.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	72
Description			
This section includes a description of the module, 100-150 words			

Module 38

Code	Course/Module Title	ECTS	Semester
GEO-47032	Engineering Geology	5.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
<p>Introduction to Engineering Geology.</p> <ul style="list-style-type: none"> -Physical Properties of Rocks 1 (Density, Porosity & Permeability). - Physical properties of Rocks 2 (Ultrasound velocities, slake durability). - Mechanical properties of Rocks (Uniaxial compressive strength, Tensile strength, Triaxial com. Str.). -Outcrop description (orientation, roughness & wall strength). - Site investigations (seepage water (seepage water, block size & persistence). - Rock engineering (major rock mass classification). - Rock quality designation (RQD) index. - Dam geology (needs for dam construction, Dam types). - Subsurface opening (Natural opening, Artificial opening). - Mohr's circles for spatial (3-D) stress analysis. Tunnel geology 			

Module 39

Code	Course/Module Title	ECTS	Semester
GEO-47033	Petroleum Geology	6.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2	1/2	78	72
Description			
<p>Introduction, the relation of petroleum geology to sciences in general, the petroleum system, basic vocabulary, historical development, the origin of petroleum, inorganic origin theory, metal carbide theory, cosmic origin theory, the organic origin theory, organic carbon in sediments, inversion of organic matter to petroleum, stages of organic matter maturation, diagenesis, catagenesis, metagenesis, types of kerogen.</p> <p>Source rocks, the basic composition of petroleum, the hydrocarbon constituents of petroleum, the nonhydrocarbon constituents of petroleum, physical properties of oils, specific gravities of oils, viscosities of oils, colours and relative indices of oils.</p> <p>Porosity, controls on porosity, sorting, grain packing, compaction, cementation, dissolution, dolomitisation, permeability, controls on permeability, reservoir rocks, migration of petroleum, primary migration, secondary migration, dismigration, vertical and horizontal migration, migration mechanism, seal rocks</p>			

Module 40

Code	Course/Module Title	ECTS	Semester
GEO-47134	Ore Geology	5.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
<p>Introduction, Economic Geology, Ore geology, Principal steps in the exploitation of ore, Factors affecting the value of cut-off grade, Ore genesis, Magmas and Magmatic fluids, Early and Late magmatic ore-deposits .</p> <p>Metasomatism, Stages of Formation of Metasomatic ores, Factors affecting the formation of Metasomatic Ores, Origin (types) of hydrothermal fluids, The Movement of Hydrothermal Fluids, Types of processes of hydrothermal ore deposition.</p> <p>Types of alteration and their ore association, Metamorphic ores, Metamorphosed ores, Submarine Exhalative and Volcanogenic oredeposits, Major types of chemical sedimentary ores, evaporates ore deposits, Placer ore-deposits</p>			

Module 41

Code	Course/Module Title	ECTS	Semester
GEO-47035	Environmental Geology	5.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
<p>Introduction, definition of environmental terms, types of environmental hazards, The hadean era ,the archian era (development of earth),development of hydrosphere ,development</p>			

of atmosphere and oxygen, the ozone , drought & desertification ,global warming,earthquakes &volcanoes ,mass movement ,,coastal hazards ,
Floods, mass extinction ,dust storms, acidic rains ,medical geology ,,vegetation (indicator plants ,botany ,biogeochemical anomaliesetc.) geozoology

Module 42

Code	Course/Module Title	ECTS	Semester
GEO-47036	Computer Application in Earth science	3.00	7
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	48	27
Description			
This section includes a description of the module, 100-150 words			

Module 43

Code	Course/Module Title	ECTS	Semester
GEO-48037	Hydrogeology	5.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
Part A – Theoretical lectures an introduction hydrogeological cycle Groundwater Pumping test Groundwater modeling [12 hrs] hydrogeochemistry Part B – Practical labs Introduction hydrogeological cycle Groundwater Pumping test hydrogeochemistry			

Module 44

Code	Course/Module Title	ECTS	Semester
GEO-48138	Well Logging	5.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2	1/2	78	47
Description			
<p>Introduction, the presentation of log data, borehole types, mud logging, mud additives, functions of drilling mud, types of drilling fluids, basic well logging equipment, wireline log tools, log tool types, electrical logs, mechanical logs, radioactive logs, acoustic Logs, well logging history, advantages and limitations of well logging.</p> <p>Basic theory on resistivity, Important terminology, definitions, and equations, Porosity, effective porosity, permeability, water saturation, the borehole environment, drilling mud, invasion, mud cake, mud filtrate, invaded zone, uninvaded zone, flushed zone, transition zone.</p> <p>Hydrocarbon saturation, Bulk volume of movable and residual hydrocarbon, resistivity logs, advantages of resistivity logs, resistivity log types, old resistivity logs, modern resistivity logs, induction log, spontaneous potential (self-potential)</p> <p>Caliper log, Gamma-ray log, total gamma-ray, spectral gamma ray, density log (RHOB), density porosity, neutron log, neutron log applications, sonic log, sonic log applications, lithology identification using well log analysis, porosity identification using well log analysis</p>			

Module 45

Code	Course/Module Title	ECTS	Semester
GEO-48039	Exploration geochemistry	6.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	72
Description			
<p>Introduction to geochemical exploration , What is geochemical exploration , Methods of Geochemical Exploration and Mineral Prospecting works, the geochemical Environments , Primary environment , Secondary environment , geochemical dispersion and mobility , mobility of elements in primary environment , mobility of elements in secondary environment, geochemical coherence , Indicator elements , pathfinder elements.</p> <p>Primary dispersion patterns , Syngenetic patterns, Geochemical province, local syngenetic pattern, Epigenetic patterns, hydrothermal dispersion patterns , dispersion patterns by the influence of temperature and pressure on the late minerals, Secondary dispersion patterns, mechanical dispersion patterns, hydromorphic dispersion patterns , biochemical dispersion patterns .</p> <p>Introduction to isotopes , decay mechanism of radioactive isotopes , the general age equation, Mass Spectrometer , The K-Ar method of dating, Argon–argon ($^{40}\text{Ar}/^{39}\text{Ar}$) method of dating.</p> <p>Rb-Sr Method of Dating, The Uranium , Thorium–Lead methods of dating , The Carbon-14 method of dating, Stable isotopes, Oxygen and Hydrogen isotopes , Sulfur Isotopes.</p> <p>Revision problem classes</p>			

Module 46

Code	Course/Module Title	ECTS	Semester
GEO-48040	Geology of Industrial Rocks	6.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)

2	1/2	78	72
Description			
<p>Introduction, Classification of economic minerals about using as raw materials for the different industries, Mining operations , Mineral Processing Technology, Classification of industrial minerals & rocks , Building and Construction materials , Aggregates, Uses of sand and gravel, Physical and mechanical properties of aggregate , Classification of Lightweight Aggregates, Building stones, Types of building stones . Features of building stone, Building stones in Iraq, Plaster (juss) industry , Metallurgical and refractory materials , Cement Industry , Manufacture stages of Portland cement, Kinds of cement, Structural clay products, Ceramic materials</p>			

Module 47

Code	Course/Module Title	ECTS	Semester
GEO-48041	Seismic & electrical methods	5.00	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2	1/2	78	47
Description			
<p>Introduction of seismic methods, Stress and strain , Elastic moduli, Seismic waves , Some basic principles for seismic waves, Ray paths in layered media (waves partitioning), Seismic refraction explorations, Seismic refraction explorations(Principles, Data acquisition, processing and interpretation) , limitations of seismic refraction exploration,. Seismic reflection explorations (Principles, Data acquisition, processing and interpretation) Introduction of geoelectrical methods, Geoelectrical properties of minerals and rocks (resistivity and conductivity), Resistivity method, [Self potential method, EM method, IP method. Advances and limitation of geoelectrical methods.</p>			

Module 48

Code	Course/Module Title	ECTS	Semester
GEO-48042	Research Project	3.0	8
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/w)
2		48	27
Description			
<p>This section includes a description of the module, 100-150 words</p>			

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