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

Academic Program Description Form for Colleges and Institutes
For the academic year 2024-2025

University: Basrah
Faculty/Institute: Science
Scientific Department: Geology
File Filling Date : 2025

Signature:

Scientific Associate Name:
Prof. Dr. Adil Ali Abdul-Hassan

Date:

Signature:

**Head of Dept.**
Asst. Prof. Dr. Ali K. Al-Ali

Date:

Check the file before
Division of Quality Assurance and University Performance
Name of the Director of the Quality Assurance and University Performance Division:
Date//
Signature Dunya Ali Hussain
29/6/2025

Approval of the Dean of the Faculty of Science

Prof. Dr. Ali A. Al-Riyahee

## First Stage/ Paleontology G105

# Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Paleontlogy G105 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 01/8/2024 |
| 9. Aims of the Course | |
| Develop the student's ability to recognize the importance of Paleontology, their presence, and distribution, environmental and economic importance. | |

| 10.Course outcomes and methods of teaching, learning and assessment |
|---|
| **a- Knowledge and Understanding goals**<br>a.1. Recognize the types of Paleontolgy .<br>a.2. Recognize the keeping of fossils in the sediments.<br>a.3. To develop the ability of the students to identify the fossils<br>a.4. To Identify Macropaleontolgy.<br>a.5. Identify the Mollusca around basrah city.<br>a.6. To understand the Geological time scale.<br>. |
| b- Systematics of fossils<br>b.1.Recognize shellsin the environment.<br>b.2. Application of fossils<br>b.3. Identify and understanding of the mode of occurrence. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. It is boosting the student to conduct research and reports.<br>3. Urging the student to make PowerPoint presentations. |
| Evaluating Methods |
| 1- Daily test and reports<br>2- Monthly exams<br>2- Final exams |
| C- Emotional and evolutional goals<br>1. The ability to recognize the importance of Systematics.<br>2. General Environments. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |

d- General Depositional Environments
1. Developing the mental abilities of the student
2. Developing the skills
3. Dealing with field and laboratory
4. Monitoring and evaluating of species and genus in the environment and the impact of climate change.

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 1. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical: Paleontolgy . Practical: Sorting of Fossilis | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Staining first semester exam practical: Using the microscope for speration the fossils | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Geological time scale and the application of fossils Practical: Identification and draw of fossils | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Explain of mollusca Practical: Classification of mollusca and see their classes | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| | | | | | |
| **11 th week, and 12th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Studying of porifera Practical: Using microscope | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **13 th week,** | **2 h. lect. 2h. lab.** | second semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Arthropoda , Practical : | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry** | **Daily and monthly tests** |
| **11. Infrastructure** | | | | | |
| **1- Textbooks required for the course** | | | Paleontolgy, Moore 1974 | | |
| **2 References** | | | Al-FarooQ, 1980-Paleontolgy | | |
| | | | | | |
| Recommended readings | | | Conference, Sympsium, Seminar, Workshop and Training Course | | |
| Electronic website | | | Google –Searching about General Paleontology- | | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

## Second Stage/ Igneous rocks G201

# Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah<br>Nael Abdul imam Kareem |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Igneous rock G201 |
| 4. Programs included in | Bachelor's. |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 20 hours + 20 practical hours |
| 8. The course description was | prepared in 01/08/2024 |

9. Aims of the Course

1- That the student understand what igneous rock is and its importance in geology.
2- That the student understand how the earth forming .
3- The student will be understand the methods of collecting samples from the field. And identify the diffrent rock in field .
4- To understand the role of geology and the risk of igneous actvities in humain life.

| |
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| 11.Course outcomes and methods of teaching, learning and assessment |
|---|
| **a- Knowledge and Understanding goals**<br>a.1. Recognize the types of igneous rock .<br>a.2. Recognize the types of magma .<br>a.3. To understand the geological history .<br>. |
| b- Subjective- Specific Skills<br>b.1.Recognize the methods of Identify the igneous rock in field.<br>b.2. Recognize the methods of Identify handspecmans.<br>b.3. Recognize the methods of Identify igneous rock in microscop. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. It is boosting the student to conduct research and reports.<br>3. Urging the student to make PowerPoint presentations. |
| Evaluating Methods |
| 1- Daily test and reports<br>2- Monthly exams<br>2- Final exams |
| C- Emotional and evolutional goals<br>1. The ability to recognize the importance of igneous rock in earth.<br>2. Linking knowledge to environmental reality. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |

d- General qualification skills transferred (other skills related to employability and personality development)

1. Developing the mental abilities of the student
2. Developing the skills
3. Dealing with field and laboratory
4. Monitoring and evaluating igneous rock in the environment .

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 2. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| 1 | 2 lect.<br>2.lab. | Introduction<br>Igneous rock | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 2 | 2 lect. | Proprties of magma | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 3 | 2.lab. | Magma forming and evlution | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 4 | 2 lect. | Volcanes | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 5 | 2.lab. | Structure of volcanics rock | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 6 | 2 lect. | Structures of plutonic rock. | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 7 | 2.lab. | Optical proprties | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 8 | 2 lect. | Classiffication of igneous rock | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| **9** | 2.lab. | Chemical of volcanics rock | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 10 | 2 lect. | Chemical of plutonic rock. | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 11 | 2.lab. | Tectonics enveroments. | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |
| 12 | 2 lect. | Occurance of igneous rock | Knowledge and understanding of lectures | Lectures | Daily and monthly tests |

| 12. Course Development Plan |
| --- |
| 1-Course development based on recent versions of books and references<br>2- field work<br>3- Neo sammles of igneous rock. |

## Second Stage/ Sedimentary rocks G202

## Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
| --- | --- |
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Sedimentary rocks G202 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |

| | |
|---|---|
| 8. The course description was | prepared in 01/08/2024 |

9. Aims of the Course

The course includes sufficient information that the student needs to distinguish the types of sedimentary rocks and estimate their importance and the type of minerals contain.

12.Course outcomes and methods of teaching, learning and assessment

**a- Knowledge and Understanding goals**

a.1. Recognize the types of sedimentary rocks; clastic, chemical, biochemical, and organic sedimentary rocks.
a.2. Recognize the main minerals in these rocks and their Optical specifications under a polarizer microscope.
a.3. Distinguish the types of sedimentary structures and the diagenesis process.

b- Subjective- Specific Skills

b.1.Recognize between the sedimentary environment
b.2. Detect the minerals contained in the different sedimentary rocks.

Learning Methods

1. Explanation and Discussion of the Lectures
2. It is boosting the student to conduct research and reports.
3. Urging the student to make PowerPoint presentations.

Evaluating Methods

1- Daily test and reports
2- Monthly exams
2- Final exams

C- Emotional and evolutional goals

1. The ability to recognize the importance of sedimentary rocks.
2. Linking knowledge to environmental reality.

| |
|---|
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |
| d- General qualification skills transferred (other skills related to employability and personality development)<br>1. Developing the mental abilities of the student<br>2. Developing the skills<br>3. Dealing with field and laboratory |

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 3. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>General introduction, definition of the types of the sedimentary rocks, their, benefits, sedimentary basins, and depositional processes.<br>Practical:<br>Studying the hand samples of clastic, chemical, biochemical, and organic sedimentary rocks. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Study the weathering processes, their types, and the intensity range effect on the minerals.<br>practical:<br>Study the clastic sedimentary rocks, and recognize the types of quartz, feldspar, rock fragments.<br>Classification the clastic sedimentary rocks according to the chemical and physical maturity. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Study the type of transportation via, determine the effective on the sediment grains, range of roundness, sorting, and matrix contained.<br>Practical:<br>Study the type and range of maturity. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Study the chemical sedimentary rocks, major types of classifications, petrophysical properties, and | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the** | **Daily and monthly tests** |

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|---|---|---|---|---|---|
| | | types of limestone, dolostone, and evaporate rocks. | | field and in the laboratory | |
| **11. Infrastructure** | | | | | |
| **1- Textbooks required for the course** | | Explain the main methods to classify the carbonate rock | | | |
| **2 References** | | | Applied sedimentology ( Selley, R. C. (2000). *Applied sedimentology*. Elsevier) | | |
| **11 th week, and 12th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Study the dolomite minerals and the mechanism form of these minerals.<br>Practical:<br>Recognize the dolomite minerals in the limesto and under polarizer microscope. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the** | **Daily and monthly tests** |
| Recommended readings | | | Boggs Jr, S., & Boggs, S. (2009). *Petrology of sedimentary rocks*. Cambridge university press. | | |
| | | | | | |
| **13 th week,** | **2 h. lect. 2h. lab.** | second semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Study the evaporate minerals and the type and coal rocks.<br>Practical :<br>Practical semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | |
|---|---|
| Electronic website | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

## Second Stage/ Hydrology G205

## Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Hydrology G205 |

| | |
|---|---|
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 01/08/2024 |

9. Aims of the Course

Develop the student's ability to recognize the importance of water resources, their presence, and distribution, environmental and economic importance. As well as recognize the sustainability methods and water balance methods to manage the drainage basins and the factors affecting on it

13.Course outcomes and methods of teaching, learning and assessment

**a- Knowledge and Understanding goals**

a.1. Recognize the types of water in the world nature .
a.2. Recognize the hydrological water cycle in the nature and calculate the water balance.
a.3. To develop the ability of the students to identify the water balancing factors
a.4. To Identify the drainage basins and their impact on water resources
a.5. Identify the sustainability topics and management for surface and ground water resources.
a.6. To understand the physical, chemical and environmental properties of surface water
.

b- Subjective- Specific Skills

b.1.Recognize the sources of surface and ground water in the environment.

b.2. Acquiring the skills of calculating the water balance and analyzing its results

b.3. Identify and understanding of sustainability methods and how to achieve them.

| Learning Methods |
|---|
| 1. Explanation and Discussion of the Lectures<br>2. It is boosting the student to conduct research and reports.<br>3. Urging the student to make PowerPoint presentations. |
| Evaluating Methods |
| 1- Daily test and reports<br>2- Monthly exams<br>2- Final exams |
| C- Emotional and evolutional goals<br>1. The ability to recognize the importance of water resource in earth system.<br>2. Linking knowledge to environmental reality. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |
| d- General qualification skills transferred (other skills related to employability and personality development)<br>1. Developing the mental abilities of the student<br>2. Developing the skills<br>3. Dealing with field and laboratory<br>4. Monitoring and evaluating water resources in the environment and the impact of climate change. |

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 4. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>General introduction, definition of water resources, their, benefits, presence, distribution and elements of the hydrologic water cycle.<br>Practical:<br>Studying the converting units of water basins and statistical methods and their interpretation | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Explanation of the hydrologic cycle elements and water balance equation, infiltration and their calculation Methods<br>first semester exam<br>practical:<br>Explain and solve the experimental equations for the hydrological cycle elements | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Evaporation, Measurement Determination Methods<br>Practical:<br>Explain and solve the experimental equations for the hydrological cycle elements, evaporation Penman method and Thorn Thwaite method | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Surface runoff, physical properties of drainage basins, surface runoff methods<br>Practical:<br>Explain surface runoff method, solving experimental problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| | | equations | | | |
| | | | | | |
| **11 th week and 12th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Interception losses, measurements, determining methods Practical: Explain equations to solve the experimental problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **13 th week,** | **2 h. lect. 2h. lab.** | second semester exam | | | |
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Hydrograph , flood controls methods Practical : | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| | | | | | |

## 11. Infrastructure

**1- Textbooks required for the course**

**2 References**

Hydrology (Principles, Analysis. Design). H. m. Raghunath, second add. New Delhi. Bangalore. 2006.

* Highway Hydrology. Hydraulic Design Series Number 2, Second Edition. Richard H. McCuen, Peggy A. Johnson, Robert M. Ragan. Greenhorne and O'Mara, Inc 9001 Edmonston Road Greenbelt, Maryland 20770. 2002

Recommended readings

Engineering Hydrology by Ir. W. Spaans. 1996. IHE/Savenije/de Laat/Spaans

Electronic website

## 12. Course Development Plan

Course development based on recent versions of books and references..
The adoption of modern interactive teaching methods.
Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences.

## Second Stage/ Geophysics G207

# Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Geophysics G207 |
| 4. Programs included in | Bachelor's |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 01/08/2024 |
| 9. Aims of the Course | |
| Develop the student's ability to identify the foundations and principles of geophysical methods. And linking these methods in identifying the underground and giving an idea of what is there and how to detect it. | |

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|---|
| 14.Course outcomes and methods of teaching, learning and assessment |

**a- Knowledge and Understanding goals**

a.1. A preliminary idea about the interior of the earth and how we can identify what it contains.

A.2. Identify the types of geophysical methods.

A.3. To develop students' ability to derive basic principles and equations for each method

A.4. Study the physical properties of each method

.A-5. Some geophysical applications of these methods.

Learning Methods

1. Explanation and Discussion of the Lectures
2. It is boosting the student to conduct research and reports.
3. Urging the student to make PowerPoint presentations.

Evaluating Methods

1- Daily test and reports
2- Monthly exams
2- Final exams

C- Emotional and evolutional goals

1. The ability to recognize the importance of geophysical methods to study the subsurface of the earth.
2. Linking knowledge to environmental reality.

Learning Methods

1. Explanation and Discussion of the Lectures
2. Boosting the student to conduct research and reports.
3. The student PowerPoint presentations.

d- General qualification skills transferred (other skills related to employability and personality development)

1. Developing the mental abilities of the student
2. Developing the skills
3. Dealing with field and laboratory
4. Understand the applications of engineering geophysics and the environment.

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 5. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical: General introduction, definition of basic of geophysics, their, benefits, presence,. Practical: Studying the converting units and statistical methods and their interpretation | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Learn about the first geophysical (gravity )methods, their principles and applications practical: Explain and solve the experimental equations for some gravity problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Learn about the second geophysical (magnetic )methods, their principles and applications Practical: Explain and solve the experimental equations for some magnetic problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Learn about the third geophysical (electric )methods, their principles and applications Practical: Explain and solve the experimental equations for some electric problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| | | | | | |
| **11 th week, and 12th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Learn about the forth geophysical (seismic )methods, their principles and applications Practical: Explain equations to solve the experimental problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **13 th week,** | **2 h. lect.** | second semester | **Knowledge** | **Understand the** | **Daily and** |

| | | | | | |
|---|---|---|---|---|---|
| | **2h. lab.** | exam | **and understanding of lectures** | **evolving state of knowledge learn to carry out practical** | **monthly tests** |
| **11. Infrastructure** | | | | | |
| **1- Textbooks required for the courc** | | | | **field and in the** | |
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Hydrograph , flood control methods<br>Practical :<br>Practical semester exam | | | |

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|---|---|
| | |
| **2 References** | **Buday, T. and Jassim, S.Z., 1987.** The Regional Geology of Iraq, Vol.2, Tectonism, Magmatism and Metamorphism., S.E.Geological Survey and Mineral Investigation, Baghdad, Iraq, 352 p<br><br>-Sharma, P.V., 1986; Geophysical methods in geology, Elsevier Scientific publish. Amsterdam, 428P.<br><br>- |
| Recommended readings | Sharma, P.V., 1986; Geophysical methods in geology, Elsevier Scientific publish. Amsterdam, 428P. |
| Electronic website | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

## Second Stage/ Structural Geology G209

# Course Description Form

Structural Geology: Deals with the origin, geometry and kinematics of structures' formation. It requires an ability to visualize objects in three dimensions.

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Structural Geology G209 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 1/8/2024 |

9. Aims of the Course

- Observing and understanding geological structures helps us to determine the kinds of stresses that have existed within Earth in the past. This type of information is critical to our understanding of plate tectonics, earthquakes, the formation of mountains, metamorphism, and Earth resources
- Structural geology, scientific discipline that is concerned with rock deformation on both a large and a small scale. Its scope of study is vast, ranging from submicroscopic lattice defects in crystals to fault structures and fold systems of the Earth's crust.

- Rocks are the most common material which is used in the construction of foundation. The local geology of an area is important when planning a major construction . The full knowledge of geology increase the strength, stability, and durability of civil engineering projects. ect

15.Course outcomes and methods of teaching, learning and assessment

**a- Knowledge and Understanding goals**

How does the Earth respond to applied force? This course looks at how rocks deform and change shape, and how we can recognise and use structures within rocks to determine ancient magnitudes and orientations of stress fields. Students will be introduced to techniques of recording and analysing structural data and taught how to map rock sequences in the field and interrogate a region to determine how it formed and what has happened to the area since formation. Details of field trip communicated at start of the course. .

b- Subjective- Specific Skills

- o understand the description and analysis of deformation structures, processes and systems in the Earth, including the relationship between tectonics and surface processes.

- Measurement and analysis of deformation structures in the field
- Stress and faulting - hydraulic fracture and fluid flow in faults/fracture systems.
- Strain - ellipsoids and volume change.
- Material lines - coaxial vs non-coaxial strain.
- Stereonets.
- Fault rocks and shear sense indicators.
- Crustal deformation.
- Tectonics: rhelogy and thermal structure of the lithosphere.
- Collision zones and thrust belts.
- Rift systems and extensional fault systems.
- Strike-slip faults and terrane tectonics.

Learning Methods

1. Explanation and Discussion of the Lectures
2. It is boosting the student to conduct research and reports.
3. The practical application, which includes the explanation and application of the theoretical part.

Evaluating Methods

1- Daily test and reports
2- Monthly exams
2- Final exams

C- Emotional and evolutional goals

The study of structural geology has a primary importance in economic geology, both petroleum geology and mining geology. The main target of structural geology is to use measurements to understand the stress field that resulted in the observed strain and geometries. We can also understand the structural evolution of a particular area due to plate tectonics (e.g. mountain building, rifting).

An essential importance of structural geology is to know areas that contain folds and faults because they can form traps in which the accumulation and concentration of fluids such as oil and natural gas occur. Environmental geologists and hydrologists need to understand structural geology because structures are sites of groundwater flow and penetration which may have an effect on leakage of toxic materials from waste dumps or leakage of salty water into aquifers.

Learning Methods

1. Explanation and Discussion of the Lectures
2. Boosting the student to conduct research and reports.
3. The student PowerPoint presentations.

d- General qualification skills transferred (other skills related to employability and personality development)

1. Developing the mental abilities of the student
2. Developing the skills
3. Developing life.
4. long learning and education.

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 6. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical: Introduction of Structural Geology, Geological Structures and Types of Folding. Practical: Knowing the types of directions, determining the position of linear and planar elements and stereoscopic projection. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Fold Tightness , Classification of folds based on the orientation of hinge line and the axial surface and Mechanics and causes of Folding. practical: Wolf's network, polar network, fold analysis and classification, B- Diagram. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Brittle Deformation and Types of Fractures. Practical: Analyze and classify folds using polar grid, pie chart, preferred trend patterns, classify fractures using grids. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Types of Fractures and Principal Stress Axes Practical: Anderson method and Fault method containing polished plate grooves. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| | | | | | |
| **11 th week,** | **2 h. lect. 2h. lab.** | Theoretical: Review previous topics Practical: | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| | | Review previous topics | | **out practical work, in the field and in the laboratory** | |

| **11. Infrastructure** | |
|---|---|
| **1- Textbooks required for the course** | |
| **2 References** | [1] Billings, M.P., 1972: (Structural Geology). 3rd. ed., New Delhi Prentice-Hall, Inc., p. 606.<br>[2] Fleuty, M.J., 1975: (Slickensides and Slickenlines). Geol.Mag., Vol.112, No.3, pp.319- 322.<br>[3] Plummer, C.C., D. McGeary, D.H. Carlson, 2003: (Physical Geology). McGraw-Hill, New York, Ninth edition, P. 574.<br>[4] Ramsay, J.G., 1967: (Folding and Fracturing of Rocks). McGraw-Hill, NewYork, p.568.<br>[5] Ramsay, J.G. and Huber, M., 1987: (The Techniques of Modern Structural Geology: Vol.2, Folds and Fracture). Academic Press.Inc.London, p.391.<br>[6] Van der Pluijm, B.A. and S.Marshak, 1997: (Earth Structure An Introduction to Structural Geology and Tectonics). McGraw-Hill, P.495.<br>[7] Turner, F.J. and Weiss, L.E., 1963: (Structural Analysis of Metamorphic Tectonites). McGraw-Hill, New York, p.545.<br>[8] Park, R.G., 1997: (Foundations of Structural Geology). Chapman and Hall, 3rd. ed., p.202. |
| Recommended readings | Structural Geology, 2017 |
| Electronic website | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

## Second Stage/ Geological Statistics G230

## Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Geological Statistics / G230 |
| 4. Programs included in | Bachelor |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours |
| 8. The course description was | prepared in 01/08/2024 |

| 9. Aims of the Course |
| --- |
| Primary knowledge of the second stage students to understand the fundamentals of applicative statistical parameters in Geology sectors. The principles of statistics, classification of data, type of statistics, descriptive statistics and a little of inferential statistics. The aim is that the student should have enough background of statistic after graduation. |

| 16.Course outcomes and methods of teaching, learning and assessment |
| --- |
| **a- Knowledge and Understanding goals**<br>a.1. Understanding what is statistics.<br>a.2. Classification of data<br>a.3. Presentation of data<br>a.4. Types of Statistics.<br>a.5. Descriptive Statistics.<br>a.6. Inferential Statistics.<br>. |
| b- Subjective- Specific Skills<br>b.1.Abbility to applicate the Statistics parameters in geology.<br>b.2. Assist the students to apply in other fields. |
| Learning Methods |
| 1. Present the lectures in class.<br>2. Example discussion and exercise.<br>3. Exam the students and quiz in class, then share the solutions. |
| Evaluating Methods |
| 1- Weekly quiz.<br>2- Monthly exam.<br>3- Seasonal final exam. |

| |
|---|
| C- Emotional and evolutional goals<br>1. Understanding the course and capability to applicate it. |
| Learning Methods |
| 1. Present the lectures in class.<br>2. Example discussion and exercise.<br>3. Exam the students and quiz in class, then share the solutions. |
| d- General qualification skills transferred (other skills related to employability and personality development)<br>1. Mathematical background development.<br>2. Mathematical skills refresh.<br>3. Encourage to applicate the computer softwares.<br>4. |

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportur

**11. Infrastructure**

| **1- Textbooks required for the course** | | | Lectures prepared. | | |
|---|---|---|---|---|---|
| **Week** | **Hours** | **Unit name** | **Course Outcomes** | **Learning method** | **Evaluation method** |
| **1st** | 2 | Theoretical:<br>General introduction and definitions | Understanding the introduction and concepts. | Lecture in class | Daily and monthly tests |
| **2nd** | **2** | Theoretical:<br>Data classification<br>Data presentation methods | Easily to recognize the data types. | Lecture in class | Daily and monthly tests |
| **3rd** | **2** | Theoretical:<br>Descriptive statistics.<br>Measure of tendency | Learning how applicate the measures. | Lecture in class | Daily and monthly tests |
| **4th** | **2** | Theoretical:<br>Measure of variability.<br>Relative positions of data | Learning how applicate the measures. | Lecture in class | Daily and monthly tests |
| **5th** | **2** | Theoretical:<br>Inferential statistics.<br>Probability fundamentals | Learning how applicate it. | Lecture in class | Daily and monthly tests |
| **6th** | **2** | Theoretical:<br>Probability hypotheses with presented examples. | Learning how applicate it. | Lecture in class | Daily and monthly tests |
| **7th** | **2** | Theoretical:<br>Normal distribution. | Learning how applicate it. | Lecture in class | Daily and monthly tests |
| **8th** | **2** | Theoretical:<br>Correlation and Regression | Learning how applicate it. | Lecture in class | Daily and monthly tests |

| | |
|---|---|
| **2 References** | Beginning Statistics. Version 1.0. |
| Recommended readings | Any publication covers the statical applications. Case studies and papers adopted the statics to study the geological fields. This will give direct and simplest understanding of the tool and specialization. |
| Electronic website | NA |

| 12. Course Development Plan |
|---|
| - The course was updated using the worldwide publications collected from internet and reference textbooks last years and will continue to add extra and replace the contents by simplest way and more beneficial / effective to the students.<br>- Trying to include the softwares of statistics applications within the course where it considers applicable class. The aim to simplify it as much as possible.<br>- Planning to encourage the students to adopt the statists applications when they have been assigned to complete the graduation project in the last stage of study. |

## Third Stage/ Stratigraphy G301

# Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Stratigraphy G301 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 01/8/2024 |

9. Aims of the Course

**Stratigraphy: is the science of rock strata.**

What does that mean?

- Stratigraphy is concerned with age relationships of strata.
- Successions of beds, local and worldwide correlation of strata.
- Stratigraphic order and chronological arrangement of beds in the geological column.
- Stratigraphy gives you techniques for working out earth history.
- How earth and its life forms evolved?
- Test ideas on how varying combinations of processes affect the plants through time?

- Together, history and process let you work out how, when, and why environments changed through time.
- Stratigraphy also helps you to understand how many economic materials formed and got distributed in the way they did- and so will help you find more.

## 17.Course outcomes and methods of teaching, learning and assessment

### a- Knowledge and Understanding goals

- Basic concepts of stratigraphy
- Tracing environments in space and time using stratigraphic tools.
- Interpreting geologic history.

### b- Subjective- Specific Skills

- drawing the age relationships of strata.

•drawing the successions of beds, local and worldwide correlation of strata.

•recognize and interpret the stratigraphic order and chronological arrangement of beds in the geological column.

- Drawing lithology and facies maps.
- Represent the lithological cross section of beds through space and time.
- Recognize the biozones and chronozone of beds.
- Formal writing of stratigraphic information
- understanding types of data required for stratigraphic software.

Learning Methods

Evaluating Methods

1- Daily test and reports
2- Monthly exams
3-Seminar
4- Final exams

C- Emotional and evolutional goals

1.work and learn as team of workers.

2. Brainstorming of idea.

3- Observation and synthesis of different geological phenomena.

Learning Methods

1. Explanation and Discussion of the Lectures
2. conduct research and reports.
3. PowerPoint presentations.

d- General qualification skills transferred (other skills related to employability and personality development)

- Field work
- Work in team
- Using Stratigraphy software
- Artistic ability of observation, recognition and interpretation of earth phenomena.
- Representation of idea through space and time.

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 8. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>- Introduction Principles of Stratigraphy<br>- Stratigraphic-Sedimentologic Data Base<br>- Lithostratigraphyand Lithodemic Units<br><br>Practical:<br>• Formal writing of the basic stratigraphic information<br>• draw the basic lithological section<br>• Identify stratigraphic contacts<br>• Using scale<br>• Using symbol<br>• Using Sedlog Software* | - Formal writing of stratigraphic information<br>-understanding and drawing basic stratigraphic and lithologic sections<br>- understanding types of data required for stratigraphic software. | Lectures and laboratory work | Writing report |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical: -<br>**Biostratigraphy**<br>• Definition<br>• Facies fossils vs. zone fossils<br>• Kinds of biostratigraphic units<br>• Boundaries (biohorizones)<br>• Name of biozone<br>• Good zone fossils<br>• Graphic correlation with fossils<br>• Composite standard section<br>- **Chronostratigraphy and Geochronology**<br>-<br>• Kinds of geological-time units<br>• Units based on material referents<br>• Units independent of material referents | -Using fossils and ages of rocks as tools for stratigraphic division and correlation through space and time.<br>-Understanding the geological time-scale | Lectures and laboratory work | Writing report and quick exam |

| | | | | | |
|---|---|---|---|---|---|
| | | • Chronostratigraphy<br>• Ranks of chronostratigraphic units<br>• Chronozone<br>• Nomenclature<br>• Stratotype<br>• Geochronologic units<br>• Ranks and nomenclature of geochronologic units<br>• Diachronic units<br>• Ranks and nomenclature of diachronic units<br>- **First exam**<br>practical:<br>Draw a correlation section<br>• draw regional stratigraphic section<br>• Identify key beds<br>• Draw correlation section<br>• Using locations map for correlation<br>Using biostratigraphy data<br>• identify geological age using biostratigraphy<br>• Record the biostratigraphic range<br>• Identify biozones<br>• Draw graphic biostratigraphy correlation | | | |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical:- **Interpreting the record: Facies and Walther's Law**<br>• Basic definitions<br>• Scale of facies<br>• Facies Criteria<br>• Walther's Law of Facies<br>- **Facies models**<br>• Facies classification and interpretation<br>• Facies relationships and facies association<br>• Facies models and depositional environments<br><br>Practical:<br>- Stratigraphic map 1: Isopach map<br>-Stratigraphic map 2: Facies map | -Interpreting of stratigraphic sequence<br>-recognize the effect of seal level changes | Lectures and laboratory work | Writing report |
| **9 th week,** | **2 h. lect.** | Theoretical: - **Cycles and** | Understanding | Lectures | Writing |

| | | | | | |
|---|---|---|---|---|---|
| **and 10th weeks** | **2h. lab.** | **cyclicity**<br>• Concepts of cycle and sequence<br>• The major types of stratigraphic cycle<br>• Base level and eustasy<br>• Allogenic controls on sedimentation<br>• Autogenic controls on sedimentation<br>• Scenarios of sea level<br><br>Practical:<br>-Using software<br>-Surfer Software* | the effects of climate changes and tectonic on stratigraphic records.<br>-using stratigraphic software | and laboratory work | report<br>Quick exam |
| | | | | | |
| **11 th week, and 12th weeks** | **2 h. lect.**<br>**2h. lab.** | Theoretical: **Sequence stratigraphy 1**<br>• Introduction and historical development<br>• Basic concepts<br>• Sequence stratigraphic units<br>• Sequence stratigraphic<br>**Sequence stratigraphy 2**<br>• Sequence stratigraphic surfaces<br>• Hierarchy in sequence stratigraphy<br>• Case study: sequence stratigraphy of nonmarine settings<br><br>Practical:<br>-Drawing Stratigraphic sections<br>-Drawing Stratigraphic trap section | -understanding the evolution of sedimentology and stratigraphy in the 21 Century through the concept of sequence stratigraphy | Lectures and laboratory work | Writing report |
| **13 th week,** | **2 h. lect.**<br>**2h. lab.** | **Second exam**<br>Seminar<br>(10 minute for each student to represent and discuss his/her research ) | | Exam | Student's presentation of research |
| **14 th week, and 15th weeks** | **2 h. lect.**<br>**2h. lab.** | Theoretical: **Sequence stratigraphy 3**<br>• Case study: sequence stratigraphy of marine settings<br>• Case study: sequence stratigraphy of nonmarine settings<br>Practical :<br>• identify sequence surface using subsurface data<br>• Identify system tracts and sequence | -understanding different types of stratigraphic setting. | Lectures and laboratory work | Writing report<br>Quick exam |

| | | | | | |
|---|---|---|---|---|---|
| | | • Using different sequence schools for identify sequences<br>• Draw subsurface | | | |

**11. Infrastructure**

| | |
|---|---|
| **1- Textbooks required for the course** | - Brookfield, M.F.,2004. Principles of Stratigraphy. Blackwell Publishing, 340P.<br>- North American Stratigraphic Code. , 2005. AAPG Bulletin, v. 89, no. 11, pp. 1547–1591.<br>- Maill, A.D., (2016), Stratigraphy: A Modern |

| | |
|---|---|
| | Synthesis, Springer International Publishing AG Switzerland, 454P. |
| **2 References** | - Catuneanu, O., Galloway, W. E., Kendall, C. G. St., Miall, A. D., Posamentier, H. W., Strasser, A., and Tucker M. T., 2001. Sequence Stratigraphy: Methodology and Nomineclature. Newsletters on Stratigraphy, Vol. 44/3, pp. 173-245. |
| Recommended readings | - James, N.P & Dalrymple, R.W. (Edts.), 2010, Facies Model 4, Geological Association of Canada, IV Serious, GeoText; 6, 575P.<br>-https://www.nature.com/articles/d41586-019-02381-2<br>- https://www.nhm.ac.uk/discover/what-is-the-anthropocene.html<br>- https://stratigraphy.org/ICSchart/ChronostratChart2020-03.pdf |
| Electronic website | - http://www.sepmstrata.org/page.aspx?pageid=15<br>- https://stratigraphy.org/guide/ |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

## Second Stage/ Hydrogeology G306

## Course Description Form

**In this course, the student will be able to understand in detail the distribution, movement and presence of groundwater in the subsurface layers of the earth, the most important laws that control its movement, methods of detection and extraction, and the most important factors affecting it in detail.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Hydrogeology G306 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 1/8/2024 |
| 9. Aims of the Course | |
| The student's ability to recognize the importance of water resources, their presence, distribution, environmental and economic importance, as well as their distribution in the environment. As well as methods of sustainability and measurement of primary productivity in drainage basins and the factors affecting them | |

18.Course outcomes and methods of teaching, learning and assessment

19.a- Knowledge and Understanding goals

20. A1- Identify the types of water in nature.
21. A2- Identifying the sources, presence and locations of groundwater extraction in the ground.
22. A3- Identify the characteristics of the petrophysical layers and the direction of groundwater and its movement within the earth.
23. A4- Knowing the laws that control the movement of groundwater, its derivations, and the principles governing its movement.
24. A5- Study of the hydraulics of groundwater.
25. A 6- Knowing the methods of drilling shallow and deep underground wells.
26. A 7- The reasons for the fluctuation of groundwater levels and the factors affecting it.
27. A8- Surface and subsurface detection methods for groundwater.
28. A9- Salt intrusion into groundwater aquifers
29. .
30.

b- Subjective- Specific Skills

b.1.Recognize the sources of surface and ground water in the environment.

b.2. Acquiring the skills of calculating the water balance and analyzing its results

b.3. Identify and understanding of sustainability methods and how to achieve them.

Learning Methods

1. Explanation and Discussion of the Lectures
2. It is boosting the student to conduct research and reports.
3. Urging the student to make PowerPoint presentations.

Evaluating Methods

| |
|---|
| 1- Daily test and reports<br>2- Monthly exams<br>2- Final exams |
| C- Emotional and evolutional goals<br>1. The ability to recognize the importance of water resource in earth system.<br>2. Linking knowledge to environmental reality. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |
| d- General qualification skills transferred (other skills related to employability and personality development)<br>1. Developing the mental abilities of the student<br>2. Developing the skills<br>3. Dealing with field and laboratory<br>4. Monitoring and evaluating water resources in the environment and the impact of climate change. |

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 9. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Introduction to the definition of groundwater resources, ways of their presence and sources, and the origin of this water in the layers of the earth<br>.<br>Practical:<br>a practical study of the characteristics of petrophysical underground reservoirs | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | **Theoretical:**<br>**An explanation of the laws that control the movement of groundwater and its basic derivations**<br>**The practical side:**<br>**Calculation of the natural recharge of groundwater reservoirs and its** | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| | | **relationship to climate**<br>**first semester exam** | | | |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | **Theoretical:**<br>**Knowing the laws that control the movement of groundwater, its derivations, and the principles controlling its movement**<br>**The practical side:**<br>**Calculation of the hydraulic characteristics of the aquifer (Theiss method)** | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | **Methods of drilling shallow and deep underground wells**<br>**The practical side:**<br>**Calculation of the hydraulic characteristics of an aquifer (Jacob method)** | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| | | | | | |
| **11 th week, and 12th weeks** | **2 h. lect. 2h. lab.** | **the theoretical side:**<br>**Surface and subsurface detection methods for groundwater**<br>**The practical side:**<br>**Calculation of the hydraulic properties of the aquifer (Thim method)** | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **13 th week,** | **2 h. lect. 2h. lab.** | second semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Hydrograph , flood controls methods<br>Practical :<br>Practical semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the** | **Daily and monthly tests** |
| **11. Infrastructure** | | | | | |
| | | | | | |

| | |
|---|---|
| **1- Textbooks required for the course** | |
| **2 References** | Hydrology (Principles. Analysis. Design). H. m. Raghunath, second add. New Delhi. Bangalore. 2006.<br><br>* Groundwater hydrology ( David Todd) Third edition /2005 |
| Recommended readings | Engineering Hydrology by Ir. W. Spaans. 1996. IHE/Savenije/de Laat/Spaans |
| Electronic website | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

**Third Stage/** Petroleum Geology G307

## Course Description Form

| |
|---|
| **Students' understanding of the basic elements in the petroleum system, and students' understanding of the facts and theories of oil formation, students' ability to identify and describe the effects of important geological factors on reservoir properties, porosity and permeability, students' knowledge of sedimentary basins, oil exploration, their locations, and potential risks.** |

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Petroleum Geology G307 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 18/8/2024 |
| 9. Aims of the Course | |

Introduce the student to the geological formations and the various deposits containing oil and how to explore and produce them. It also includes: Introduction to petroleum geology - origin of oil and gas - formation of oil - chemical composition of oil - physical properties of oil - properties of reservoir rocks (porous - permeability) - oil-generating rocks - sedimentary basins - migration and accumulation of oil - oil's relationship with different types of rocks Especially sedimentary rocks - methods of exploration and oil exploration - oil traps - oil fields in Iraq

31.Course outcomes and methods of teaching, learning and assessment

**a- Knowledge and Understanding goals**

a. Know the basic elements of the petroleum system
b. Know the facts and theories of the formation of petroleum
c. The ability to describe the geological factors affecting the oil reservoir
d. Determining migration paths
e. Economic importance and methods of exploration for oil
f. Knowledge of oil fields and geological formations containing oil in Iraq

b- Subjective- Specific Skills

The role of geology and its importance in knowing where petroleum is located and ways of exploration it - knowing where it accumulation- the economic benefit

Learning Methods

1- Using the presentation in the explanation and clarification of graphics, pictures, tables and educational videos
2- Applying the practical part by using exercises and maps
3- Presentation of special case studies from the oil fields in Iraq
4- Student participation through discussion and presentation

Evaluating Methods

1- Laboratory reports, practical exercises, arithmetic problems and maps
2-Monthly exams (1st and 2nd month)
3- Final exams (practical and theoretical)

C- Emotional and evolutional goals

1. The ability to identify the importance of oil sources and the role of the geologist in oil.
2.Linking oil exploration with economic costs and using the best methods for oil exploration

1-Giving
2- Powerpoint presentation and documentaries
3- Solve arithmetic problems and apply practical work with mapping and learning programs

## 10. Sequencing of course content

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st and 2ed weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Introduction to petroleum geology, oil well drilling and drilling rag components in drilling oil wells<br>Practical:<br>Determining the lag time | To familiarize the student with the basic concepts of petroleum geology | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **3ed** week | **2 h. lect. 2h. lab.** | Theoretical:<br>The origin and formation of petroleum<br>practical:<br>Calculation of heat flow | The student should understand the theories and hypotheses of the formation of oil and the petroleum system. | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week,** | **2 h. lect. 2h. lab.** | Theoretical:<br>Stages of maturation of organic matter and the formation of petroleum<br>Practical:<br>Calculation of pressures in geological formations | The student should have the ability to explain how oil is created and the stages of its formation from organic materials to the production of hydrocarbons. | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **5 th** | **2 h. lect. 2h. lab.** | Theoretical:<br>Geochemistry of petroleum<br>Practical:<br>Representation of the chemical composition of oil and its classification by categories | Knowing the chemical composition of oils | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **6th week** | **2 h. lect. 2h. lab** | Theoretical:<br>The physical properties of the oil<br>Practical:<br>Determination of the physical properties of a | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

d- General qualification skills transferred (other skills related to employability and personality development)

1- Developing the mental abilities of the student and skill abilities of the student

| | | | | | |
|---|---|---|---|---|---|
| | | sample of oils | | | |
| **7 th week,** | | First monthly exam | | | |
| **8th week** | **2 h. lect. 2h. lab.** | Theoretical:<br>Petroleum Source Rocks Characterization<br>Practical :<br>Calculating specifications for oil-generating rocks and determining their capacity, maturity and type of kerogen in the samples | The student will be able to evaluate the source rocks in several ways | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Oil migration,<br>Practical :<br>Calculation of oil reserves by volumetric method 1 | Knowing the types of migration, its paths and mechanisms | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **11 th week** | **2 h. lect. 2h. lab** | Theoretical:<br>oil reservoirs1<br>Practical :<br>Calculation of oil reserves by volumetric method 2 | The student should have the ability to evaluate the properties of oil reservoirs | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **12th week** | **2 h. lect. 2h. lab** | Theoretical:<br>oil reservoirs2<br><br>Practical :<br>Interpretation map of the source rocks | That the student have an idea of determining the properties of the reservoir. The student knows the methods of calculating the properties of the reservoir (porosity, permeability and saturation) | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| **13 th week** | **2 h. lect.**<br>**2h. lab** | Theoretical:<br>Cap rocks and traps<br>Practical:<br>capacity of one of the oil fields | The student should be familiar with the type of traps, the type of cap rocks and its efficiency | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **14 th week** | **2 h. lect.**<br>**2h. lab** | Theoretical:<br>sedimentary basins<br><br>Practical:<br>Determining the type of trap for an oil field | That the student have the ability to explain the sedimentary basins in Iraq and the Arabian Gulf | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **15th week** | **2 h. lect.**<br>**2h. lab** | Theoretical:<br>Oil fields in Iraq<br><br>Practical:<br>semester exam | The student's understanding of the geological formations containing oil in Iraq and the reasons for the abundance of oil in the Middle East | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

**11. Infrastructure**

**1- Textbooks required for the course**

**2 References**

-Elements of Petroleum Geology, New York 2nd , Selley, R.C

-Petroleum Development Geology , Tulsa, Oklahoma Dickey, P.A., 1981

-Petroleum Formation and Occurrence, New York 2nd Tissot, B.P., and Welte

| | |
|---|---|
| | - Petroleum geology and geochemistry (Khaled Banat) |
| Recommended readings | |
| Electronic website | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>And the adoption of modern interactive teaching methods. And work to activate the field work to the oil companies Conducting an exchange of experiences with oil companies and training students on modern programs |

## hird Stage/ Oil Reservoir G308

## Course Description Form

| |
|---|
| **The course provides an opportunity for students to learn how to study oil reservoir and calculate their properties of oil reservoir in and in practice.** |

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |

| | |
|---|---|
| 3. Course name/Code 1. Programs included in it | Oil Reservoir G308 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 30 practical hours |
| 8. The course description was | prepared in 1/8/2024 |

9. Aims of the Course

Ability of student to calculate an oil reservoir properties and diagnose of flow units in the reservoir.

32.Course outcomes and methods of teaching, learning and assessment

**a- Knowledge and Understanding goals**

1- Identify on the petrophysical properties of the rocks.
2- Identify the properties of fluids.
3- Study the relationship between pressure, volume and temperature in reservoir condition.
4- Learning how to use equations in reservoir calculation.
5- Learning how can use software.

.

b- Subjective- Specific Skills

1- Acquiring proficiency in petrophysical computation.
2- Gain skills to use equation and software.

Learning Methods

1. Explanation and Discussion of the Lectures
2. It is boosting the student to conduct research and reports.

| Evaluating Methods |
| --- |
| 1- Daily test and reports<br>2- Monthly exams<br>2- Final exams |
| C- Emotional and evolutional goals<br>1- Being able to understand the importance of characterizing the properties of reservoir rock.<br>2- Identification of the properties of reservoir fluids. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |
| d- General qualification skills transferred (other skills related to employability and personality development)<br>1. Developing the mental abilities of the student<br>2. Developing the skills |

## 11. **Sequencing of course content**

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week,** | **2 h. lect.**<br>**2h. lab.** | Theoretical:<br>introduction<br>Practical:<br>Description and analysis of the core. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **2ed,** | **2 h. lect.**<br>**2h. lab.** | Theoretical:<br>Porosity<br>practical:<br>The methods of calculating porosity in the lab. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **3ed** | **2 h. lect.**<br>**2h. lab.** | Theoretical:<br>Absolute permeability<br>Practical:<br>The methods of calculating Absolute permeability in the lab. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week,** | **2 h. lect.**<br>**2h. lab.** | Theoretical:<br>Factors affecting on porosity and permeability<br>Practical:<br>The methods of calculating effective permeability in the lab. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **5 th** week | **2 h. lect.**<br>**2h. lab.** | Theoretical:<br>effective and relative permeability<br>Practical:<br>Pressure-Temperature Diagram | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **6th week** | **2 h. lect.**<br>**2h. lab.** | Theoretical:<br>Weighted-Average of Porosity, Permeability, and water saturation. | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| | | Practical:<br>Determination of saturation exponent (n) | | field and in the | |
| **7 th week,** | **2 h. lect.<br>2h. lab.** | Theoretical:<br>wettability, surface tension and capillary pressure<br>Practical<br>The methods of calculating capillary pressure<br>in the lab. | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **8th week** | **2 h. lect.<br>2h. lab.** | Theoretical:<br>Hysteresis effects in relative permeability and Klinkenberg effect<br>Practical<br>The methods of calculating flow unit | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week** | **2 h. lect.<br>2h. lab.** | Theoretical:<br>exam<br>Practical<br>exam | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **10th week** | **2 h. lect.<br>2h. lab.** | Theoretical<br>Fundamentals of reservoir fluid flow<br>Practical<br>**Pressure-Volume-Temperature Data** | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **11 th week** | **2 h. lect.<br>2h. lab.** | Theoretical:<br>Linear flow of incompressible fluids<br>Practical<br>**Saturation pressure** | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **12th week** | **2 h. lect.<br>2h. lab.** | Theoretical<br>Linear flow of slightly compressible fluids<br>Practical | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| | | **The Compressibility Factor** | | | |
| **13 th week** | **2 h. lect. 2h. lab.** | Theoretical: Radial flow of incompressible fluids Practical **The gas-formation volume factor** | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **14 th week** | **2 h. lect. 2h. lab.** | Theoretical: Radial flow of Slightly compressible fluids Practical **Gas Solubility** | | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **15th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Multiphase flow Practical : **The Oil-Formation Factor** | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| **11. Infrastructure** | |
|---|---|
| **1- Textbooks required for the course** | Oil reservoir |

| | |
|---|---|
| **2 References** | Tarek Ahmed-Reservoir-Engineering-Handbook |
| Recommended readings | Recent scientific sources |
| Electronic website | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

## Fourth Stage/ Geotectonic G404

## Course Description Form

**This course describes the dynamic movement of the Earth and the most important theories for the development of the movements of tectonic plates with the forces causing these movements and the most important types of tectonic plates and their boundaries**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Geotectonic G404 |
| 4. Programs included in | Bachelor |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 1/8/2024 |

| 9. Aims of the Course |
| --- |
| Teaching students the previous theories that explain the movement of the continents and the latest theories about those movements in addition to studying the boundaries of these plates and the most important results of the collision and divergence of these plates, also the earthquakes and volcano that companied with plates movements. |

| 33.Course outcomes and methods of teaching, learning and assessment |
| --- |
| **a- Knowledge and Understanding goals**<br>A 1- the previous theories for movements of plates<br>.A2- study of plate tectonic theory<br>A3- define the convergence boundaries and the results for these<br>.boundaries<br>.A4- - define the Divergent boundaries and the results for these boundaries<br>.A 5- define the transform boundaries and the results for these boundaries<br>A 6- Knowing the most important natural events that devastate the Earth,<br>.such as volcanoes, and earthquakes that companied with tectonic of earth |
| B1 – divided the Iraq depending on tectonic events<br>B2 – interpretation for the system of faults in Iraq<br>B 3 - Drawing maps showing the modern division of tectonic movements to Iraq . |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. It is boosting the student to conduct research and reports.<br>3. Practical application, which includes an explanation of the important geological foundations in knowing the history of the chronology of the layers of the earth and the processes of matching between them. |
| Evaluating Methods |
| 1- Daily test and reports<br>2- Monthly exams<br>2- Final exams |

| |
|---|
| C- Emotional and evolutional goals<br>Usually, the student learns about the history of the Earth and the development of biology, information contrary to what has been proven by science. In this course, it will be based on the latest astronomical and biological theories far from myths. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |
| d- General qualification skills transferred (other skills related to employability and personality development)<br>1. Developing the mental abilities of the student<br>2. Developing the skills<br>3. Drawing manual maps and interpreting those maps<br>4- Giving a student an opportunity to visualize some complex layers in order to visualize their initial formation |

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 12. **Sequencing of course content**

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical: Introduction to Geotectonic Practical: Knowledge of the principals, basic of structural geology | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | 2 h. lect. 2h. lab. | Theoretical: Study the Geosyncline theory also Studying the sea floor spreading and continental draft theories practical: study the division of plate margins | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Plate tectonic theory With the first month exam Practical: Study of Buday ‘s (1980) tectonic division for Iraq | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Hot spot and pole wondering Practical: Study of Buday and Jassim ‘s (1987) tectonic division for Iraq | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| | | | | | |
| **11 th week, and 12th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Mechanism of Plate tectonic motion Practical: Study of Numan‘s (1997) tectonic division for Iraq | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **13 th week,** | **2 h. lect. 2h. lab.** | second semester exam Study of Fouad ‘s (2010) tectonic division for Iraq | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Earthquakes and volcanos<br>Practical :<br>Practical semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Develop new ways for students to participate in updating the curriculum and making their own presentations |

| **11. Infrastructure** | |
|---|---|
| **1- Textbooks required for the course** | Dynamic Earth: An Introduction to Physical Geology, Eric Christiansen , W. Kenneth Hamblin, |
| Recommended readings | |
| Electronic website | |

## Forth Stage/ Well Log G403

## Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |
| 3. Course name/Code 1. Programs included in it | Well Log G403 |
| 4. Programs included in | Bachelor's, Master's, Doctorate |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2023-2024 |
| 7. Total of study hours | 30 hours + 60 practical hours |
| 8. The course description was | prepared in 01/08/2024 |

9. Aims of the Course

The aim of this course is to give students after a finished petroleum and reservoir geology courses .The wireline logs are very important tool for determine a petrophysical properties as porosity, permeability and oil saturation .There are several applications of Logs in geological studies as a determine of reservoir pressure, boundary of units, Lithological and mineralogical, depositional environments, calculation of oil and gas reserve

34.Course outcomes and methods of teaching, learning and assessment

**a- Knowledge and Understanding goals**

a.1. Recognize the essential definitions of subsurface Geology .
a.2. Recognize the borehole environment.

a.3. To develop the ability of the students to identify Lithological and mineralogical, depositional environments
a.4. To determine the petrophysical properties as porosity, permeability and oil saturation

| |
|---|
| a.5. Identify the Types of log measurements SP & GR |
| b- Subjective- Specific Skills<br>b.1. Recognize the surface and subsurface structures that deal with oil reservoir.<br>b.2. Acquiring the skills of calculating and logs interpretation<br>b.3. Identify and understanding of required methods for developed reservoir produces. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. It is boosting the student to conduct research and reports.<br>3. Urging the student to make PowerPoint presentations. |
| Evaluating Methods |
| 1- Daily test and reports<br>2- Monthly exams<br>2- Final exams |
| C- Emotional and evolutional goals<br>1. The ability to recognize the importance of petrophysical properties as porosity, permeability and oil saturation and logging interpretation.<br>2. Linking knowledge of the courses to environmental reality in the reservoir. |
| Learning Methods |
| 1. Explanation and Discussion of the Lectures<br>2. Boosting the student to conduct research and reports.<br>3. The student PowerPoint presentations. |
| d- General qualification skills transferred (other skills related to employability and personality development)<br>1. Developing the mental abilities of the student<br>2. Developing the skills<br>3. Dealing with field and laboratory |

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 13. **Sequencing of course content**

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical: Essential Definitions of subsurface Geology & Well Logging. borehole environment Practical: Studying some property of formation surrounding the well which affect logging measurement | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Subsurface maps and sections. Classification of Logs, Classification of open hole logs first semester exam practical: Explain and solve the experimental equations Porosity, permeability, resistivity | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Electric Resistivity Logging, Resistivity Logs and Oil Saturation, Saturation Equations Practical: Explain and solve the experimental equations for Archie Parameters Rw Determination from SP Log | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical: GR Log and Uses Neutron Log and Density Logs Sonig Logging: Practical:Explain Gamma Ray Detection, Application of Sonic Logs | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

| | | | | | |
|---|---|---|---|---|---|
| | | method, solving experimental problems equations | | | |
| **11. Infrastructure** | | | | | |
| **11 th week and 12th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Auxiliary Logs , Core Data Analysis and Comparison with Logs:<br><br>Practical:<br>Explain equations to solve the experimental problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **13 th week,** | **2 h. lect. 2h. lab.** | second semester exam | | | |
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical:<br>Lithology and Mineralogy , Determination of Gas Zones and Overpressure Zones, Introduction to Interactive Petrophysics (IP Software)<br>Practical :<br>Practical semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

**1- Textbooks required for the course**

**2 References**

Recommended readings


Schlumberger,1998. *Log interpretation principles/Application*,Seventh edition,Texas,226p.

* Asquith, G. and Gibson, C. **1982**. Basic well log analysis for geologists: methods in Exploration series,AAPG,216 p.

Al-Sakini, J. **1992.** Summary of petroleum geology of Iraq and the Middle East. Northern Petroleum Company, Kirkuk, Iraq. 179 p (in Arabic).

Alsharhan, A.S., Nairn, A.E.M. **1997.** Sedimentary basins and petroleum geology of the Middle East. Elsevier, Amsterdam, 843 p.

| | |
|---|---|
| Electronic website | |

| 12. Course Development Plan |
|---|
| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |

## Forth Stage/ water resource G430

## Course Description Form

**The course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made maximum use of the available learning opportunities.**

| | |
|---|---|
| 1.Educational Institution | College of Science/ University of Basrah |
| 2. Department | Geology |

| | |
|---|---|
| 3. Course name/Code 1. Programs included in it | Water resource G430 |
| 4. Programs included in | Bachelor's |
| 5. Attendance Form Available | Weekly |
| 6. Semester/ Year | 2024-2025 |
| 7. Total of study hours | 28 hours + 60 practical hours |
| 8. The course description was | prepared in 01/08/2024 |

9. Aims of the Course

Develop the student's ability to recognize the importance of water resources, their presence, and distribution, environmental and economic importance. As well as recognize the sustainability methods and water balance methods to manage the drainage basins

35.Course outcomes and methods of teaching, learning and assessment

**a- Knowledge and Understanding goals**

a.1. Recognize the types of water in the world nature .
a.2. Recognize the hydrological water cycle in the nature and calculate the water balance.
a.3. To develop the ability of the students to identify the water balancing factors
a.4. Identify the sustainability topics and management for surface and ground water resources and other resource
a.6. To understand the physical, chemical and environmental properties of water
.

b- Subjective- Specific Skills
b.1.Recognize the sources of surface and ground water in the environment.
b.2. Acquiring the skills of calculating the water balance

Learning Methods

1. Explanation and Discussion of the Lectures
2. It is boosting the student to conduct research and reports.
3. Urging the student to make PowerPoint presentations.

Evaluating Methods

1- Daily test and reports
2- Monthly exams
2- Final exams

C- Emotional and evolutional goals
1. The ability to recognize the importance of water resource in earth system.
2. Linking knowledge to environmental reality.

Learning Methods

1. Explanation and Discussion of the Lectures
2. Boosting the student to conduct research and reports.
3. The student PowerPoint presentations.

d- General qualification skills transferred (other skills related to employability and personality development)
1. Developing the mental abilities of the student
2. Developing the skills
3. Dealing with field and laboratory
4. Monitoring and evaluating water resources in the environment and the impact of climate change.

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he has made the most of the available learning opportunities. It must be linked to the description of the program.

## 14. **Sequencing of course content**

| Week | Hours | Unit name | Course Outcomes | Learning method | Evaluation method |
|---|---|---|---|---|---|
| **1 st week, 2ed, 3ed weeks** | **2 h. lect. 2h. lab.** | Theoretical: General introduction, definition of water resources, their, benefits, presence, distribution and elements of the hydrologic water cycle. Practical: Studying the converting units of water basins and statistical methods and their interpretation | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **4 th week, 5 th and 6th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Explanation of the hydrologic cycle elements and water balance equation, practical: Explain and solve the experimental equations for the hydrological cycle elements | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **7 th week, and 8th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Evaporation, Measurement Determination Methods practical: water balance problems | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
| **9 th week, and 10th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Surface runoff, physical properties of drainage basins, surface runoff methods Practical: Hydraulic ahead equation | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |
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| **11 th week, and 12th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Interception losses, measurements, determine methods Practical: Explain equations to solve the experimental | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

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| | | problems | | | |
| **13 th week,** | **2 h. lect.** | second semester | **Knowledge** | **Understand the** | **Daily and** |
| | | exam | **understanding** | **of knowledge** | **tests** |

**11. Infrastructure**

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| **1- Textbooks required for the course** | | | | | |
| | | | | **work, in the** | |
| **2 References** | | | | **field and in the laboratory** | |
| **14 th week, and 15th weeks** | **2 h. lect. 2h. lab.** | Theoretical: Hydrograph , flood controls methods Practical : Practical semester exam | **Knowledge and understanding of lectures** | **Understand the evolving state of knowledge learn to carry out practical work, in the field and in the laboratory** | **Daily and monthly tests** |

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| | Hydrology (Principles. Analysis. Design). H. m. Raghunath, second add. New Delhi. Bangalore. 2006.<br><br>* Highway Hydrology. Hydraulic Design Series Number 2, Second Edition. Richard H. McCuen, Peggy A. Johnson, Robert M. Ragan. Greenhorne and O'Mara, Inc 9001 Edmonston Road Greenbelt, Maryland 20770. 2002 |
| Recommended readings | Engineering Hydrology by Ir. W. Spaans. 1996. IHE/Savenije/de Laat/Spaans |
| Electronic website | |

| 12. Course Development Plan |
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| Course development based on recent versions of books and references..<br>The adoption of modern interactive teaching methods.<br>Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences. |