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	2020-2019
7. Total of study hours	30 hours + 60 practical hours
8. The course description was	prepared in 2/8/2020

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

10.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.

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: 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:	**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**

		Anderson method and Fault method containing polished plate grooves.			
11 th week,	**2 h. lect. 2h. lab.**	Theoretical: Review previous topics Practical: Review previous topics	**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	[1] Billings, M.P., 1972: (Structural Geology). 3rd. ed., New Delhi Prentice-Hall, Inc., p. 606. [2] Fleuty, M.J., 1975: (Slickensides and Slickenlines). Geol.Mag., Vol.112, No.3, pp.319- 322. [3] Plummer, C.C., D. McGeary, D.H. Carlson, 2003: (Physical Geology). McGraw-Hill, New York, Ninth edition, P. 574. [4] Ramsay, J.G., 1967: (Folding and Fracturing of Rocks). McGraw-Hill, NewYork, p.568. [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. [6] Van der Pluijm, B.A. and S.Marshak, 1997: (Earth Structure An Introduction to Structural Geology and Tectonics). McGraw-Hill, P.495. [7] Turner, F.J. and Weiss, L.E., 1963: (Structural Analysis of Metamorphic Tectonites). McGraw-Hill, New York, p.545. [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.. The adoption of modern interactive teaching methods. Activating alignment programs with international universities to learn about modern curricula and to exchange the experiences.