

Ministry of Higher Education and Scientific research



Department of Earth Science and Petroleum

College of Science

Salahaddin University-Erbil

Subject: Ductile Structural Geology

Course Book – 3rd year student- 1st semester

Lecturer's name: MSc. Soran Hasan Arab Syan

Academic Year: 2023/2024

Course Book

1. Course name	Ductile Structural Geology
2. Lecturer in charge	Soran Hasan Arab
3. Department/ College	Earth Sci. and Petroleum/ college of Science
4. Contact	e-mail: soran.syan@su.edu.krd Tel: (07504916608)
5. Time (in hours) per week	Practical: 8
6. Office hours	26
7. Course code	
8. Teacher's academic profile	2020- to date--- PhD student in Structural Geology in Earth Sci. and Petroleum Dept. 2015-2020 MSc. In Structural Geology, Geology Dept. Salahaddin Univ.-Erbil 2004-2008 B.Sc. in Geology, Geology Department
9. Keywords	Fold, fault (normal, reverse, strike-slip), Fracture, Joint, stress, tectonic analysis,
10. Course overview:	The opportunity to collect facts, examines information, and draw conclusions in a scientific manner frequently result in comprehension and visualization. Learning is much more than the accumulation of knowledge; it is also the understanding that comes from “doing”. In the laboratory we hope students will refine the critical and creative thinking skills that are vital to students’ effective participation in a society
11. Course objective:	The first steps in the study of geological structures are largely geometrical. This was true in the initial stages of any field investigation, and in the education of structural geologist. This concern for geometry includes the methods of describing and illustrating the form and orientation of geologic structures, and the solution of various dimensional aspects of these structures. Another aim, method of presenting and analyzing geologic data, including geological maps, geological cross section and block diagram are given. The final purpose stereographic projection and the stereo net, and the methods of plotting and solving angular problems, and many of the same elementary problems as well as few advanced ones are solved with their use.

With this as a background, the students received basic principles in practical structural geology

12. Student's obligation

Class divided to five groups, each group has three hours per a week. About forty to fifty minutes, at beginning of each laboratory there is explanation and solving an exercise; this leads students with the help of instructor to solve remain exercises and present a report at the end of each lab. In next week Laboratory, a correct report with their degree will return to students. Absent student in the Laboratory without any formal reason will take nothing in report of this week laboratory. All Groups of students together will have three monthly examinations, each one from seven to eight laboratory exercises in previous determined time outside schedule of weekly laboratory.

Required equipments

0.5 mm mechanical pencils, colored wood pencils, ruler, protractor, triangles, graphic and trace papers, laboratory sheets and stereographic net are supplied by instructor.

13. Forms of teaching

Data-Show, white board and Overheads

14. Assessment scheme

The students are required to do two closed exams during the course period. All exams have 25% marks; the quiz tests have 5% marks, the attendance, classroom, activities, absence count and reports 5% marks.

So that the final grade will be based upon the following criteria:

Reports, Quiz and participation: 10%

Monthly exams: 25%

Total of practical: 35%

15. Student learning outcome:

Each student should know the basic principles and have actual practice with the plotting different type of structural data such as linear and planar

geometrical elements of structural features. In addition, they should be familiar with geometrical and stereographic projection procedures and reading and constructing map and cross sections

16. Course Reading List and References:

The student can find additional information and examples in the following references

1. Billings, M.P., 1972, **Structural geology**, Prentice-Hall, Inc. New Jersey, 606P.
2. Bradshaw, M.J. and Jarman, E.A., 1969, **Geological Map Exercises**, the English Universities Press Limited, London, 32P.
3. Richard J Lisle, 2004, **Geological structures and maps: A practical guide**, third edition, Elsevier.
4. Richard H. Groshong, Jr., 2006, **3-D Structural Geology: A practical guide to Quantitative surface and subsurface map interpretation**, 2nd ed., Springer.
5. Phillips, F.C., 1971, **The use of stereographic projection in structural geology**: 3rd ed., Edward Arnold, London, 90P.
6. Ragan, D.M. 1983, **Structural Geology: An Introduction to Geometrical Techniques**, John Wiley & Sons, New York, 393P.
7. Rowland, S.M., Duebendorfer, E. M. and Schiefelbein, I.M., 2007, **Structural Analysis and Synthesis: A Laboratory Course in structural Geology**: 3rd ed., Blackwell publishing Ltd. 301P.
8. Simpson, B., 1968, **Geological Maps**: Pergamon Press Ltd., Heading Hill Hall, Oxford, 98P.
9. Suppe, 1985, **Principles of Structural Geology**. Prentice-Hall, Englewood Cliffs, New Jersey, 537P.

17. The Topics:	Lecturer's name
Theory	Dr. Hasan
18. Practical Topics (If there is any)	
<p>Course Program (Practical ductile structural Geology)</p> <p>Practical ductile structural geology embraces fourteen laboratories which cover basic topic. Below name of each laboratory presented and their detail items as well as objectives are illustrated in inclined writing</p> <p>Week1: Attitude of structures. Attitude of plane and line: geometrical elements measurement, pitch, trend. Forms of attitude: three digital form, quarter form; right handed method</p> <p>Week2&3: Projection; descriptive geometrical method. Elements of projection, plane of projection, direction of projection. Normal projection: horizontal plane (map), vertical plane (structure section), rotation, folding line.</p> <p>Week4: Apparent dip. Definitions; Finding of apparent dip, for given true dip by descriptive geometrical method.</p>	<p>Soran Hasan (2 hrs)</p> <p>ex: 14/10/2023</p>

<p>Week5: True dip and strike. Definitions; Finding of true dip and strike from given the apparent dip directions, by descriptive geometrical method. From Lab. (2-5), solution of the exercises illustrated, by block diagrams.</p> <p>Week6: Three- point problem. Advantages, conditions. Finding attitude of structural plane graphically, by three points, which have known elevations and form a triangle</p> <p>Week7: Structural plane and topography. Exposures on horizontal surface and topographic relief shape of topographic contour lines in valleys, shape of strata outcrops in valleys; Rule of Vs; Block diagrams.</p> <p>Week8: Geological maps-Horizontal Beds. Basic concepts, stratum contour; recognition of the horizontal beds in geological maps; finding thickness of horizontal beds; drawing cross section for horizontal beds.</p> <p>Week9: Geological maps-Uniformly dipping strata. Distinction of the inclined strata; construction and labeling of strike lines; finding attitude of inclined beds; calculation of vertical thickness of beds, drawing cross section for inclined strata.</p> <p>Week10: Geological maps -Folded strata. Recognition of the folds from geological map, symmetrical folds, asymmetrical folds; finding attitude of hinge line, amplitude and wave length of the fold; drawing cross section for folded strata</p> <p>Week11: Geological maps-plunged folds. Geological map interpretation, symmetrical plunged fold, asymmetrical plunged fold, construction of hinge line, finding attitude of hinge line.</p> <p>Week12: Geological maps-vertical faults. Distinction of vertical faults from geological maps; vertical faults in horizontal beds and inclined beds, attitude of vertical fault, determining up throw and down throw blocks, calculating vertical displacement; drawing cross section for vertical faulted strata.</p> <p>Week13: Geological maps-inclined faults. Recognition of inclined faults, inclined faults in horizontal and inclined strata; finding attitude of inclined fault and hade angle, horizontal and vertical displacement, determining reverse and normal faults on geological map, drawing cross section for inclined faults.</p> <p>Week14: Geological map-combination structures. Geological map interpretation; given a map embrace fold, fault and unconformity surface; distinction of the unconformity surface from map; finding attitude of unconformity surface.</p> <p>Week 15: Rockware software</p>	
19. Examinations:	

1. Compositional: In this type of exam the questions usually starts with Explain how, What are the main types of convention?

1-The azimuth method is measured clockwise from north and range between 0-360.

2-The quadrant method is based on four 90°quadrants.

Compare between dip angle and plunge.

-Give three example of planar structural element.

How can you determine vertical displacement of the fault?

What is the difference between trend and strike?

Trends used to describe the direction of linear structures

While strike is the horizontal line that define the direction of planar structures.

20. Extra notes:

The student must learn some of new structural geology structures that help them to practise the labs.

21. Peer review

پیداچونہوہی ھاوہل

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

Dr. Hassan Ghazi Kak-Ameen