Universidad Zaragoza

Academic Year: 2025/26

26445 - Structural Geology

Teaching Plan Information

Academic year: 2025/26
Subject: 26445 - Structural Geology
Faculty / School: 100 - Facultad de Ciencias
Degree: 296 - Degree in Geology
588 - Degree in Geology
ECTS: 9.0
Year: 2
Semester: First semester
Subject type: Compulsory
Module:

1. General information

Aims:

(a) Learning of concepts and methodology.
(b) Use of techniques for analytical treatment and plotting of structural data.
(c) Development of research capabilities.

General goals:

1) knowing the different types of tectonic structures
2) developing observation abilities
3) learning techniques to represent and analyze tectonic structures
4) applying concepts and models of Structural Geology to regional interpretations
5) being able to work alone and in a group
6) being critical with scientific information, and able to express scientific results

This course is fundamental to decipher the geology of deformed areas. It requires the development of a 3-D visualization of the tectonic structures, as well as observation and interpretation abilities both in the lab and in the field.

2. Learning results

The student, in order to pass the course, will have to show her/his competence in the following skills:

- Identify the main type of tectonic structures as well as to know their geometric characteristics and genetic mechanisms.

- Construct geologic maps as well as schemes showing the geometry and relationship of the structures in the field.

- Measure the attitude of planes and lines using the geologic compass.

- Represent and read structural elements (planes and lines) by means of orthographic projection, stereographic projection and cross sections.Find and read scientific articles as well as select and understand the most relevant informatio.

- Work alone and in a group, as well as to defend scientific results with reasonable arguments

Importance of learning goals:

Geologic structures provide part of the basis for recognizing and reconstructing the profound changes that have marked the physical evolution of the Earth's outer layers, as observed from the scale of the plates down to the scale of the microscopic. Understanding the nature and extensiveness of deformational structures in the Earth's crust has both scientific value and practical benefit. But, there is a philosophical value as well. Our perceptions of who we are and where we are in time and space are shaped by facts and interpretations regarding the historical development of the crust of the planet on which we live. Knowing fully the extent to which our planet is dynamic, not static, is a reminder of the lively and special environment we inhabit. Once the conceptual framework within which structural geologists operate is grasped, the Earth begins to look different. In fact, natural physical processes and natural physical phenomena, whether geologic or not, never quite look the same again (from Davis and Reynolds, 1996).

3. Syllabus

Theory:

1. Introduction
2. Lines and planes in Structural Geology.
3. Stress.
4. Strain.
5. Ductile deformation.
6. Rheology.
7. Rock fabrics.
8. Folds.
9. Folding mechanisms and kinematic models.

3: Brittle structures

10. Rock fracturing.
11. Joints and shear fractures.
12. Stylolites and veins.

13. Faults.
14. Thrusts and reverse faults.
15. Normal faults.
16. Strike-slip faults.

Seminars: shear zones, diapirs, gravitational and impact structures, superposed folding, tectonic structures in plutons and non-tectonic structures.

Laboratory sessions: cross sections, stereographic and orthographic projections, tectonic fabrics, fold axis determination, contour maps, stress analysis, Riedel experiment.

Fieldwork in the Pyrenean and Iberian chains

4. Academic activities

- Theory and practice sessions (3 ECTS: 30 hours): 3 weekly hours.

- Seminars (0,5 ECTS: 5 hours): Oral presentations and discussions. Conceptual, descriptive and genetic aspects of tectonic structures. Geometric, kinematic and dynamic methods.

- Laboratory sessions (3 ECTS: 30 hours): 3 weekly hours, 10 sessions in total. How to analyze meso and micro-scale structures. Reconstructing and analyzing the geometry, kinematic and dynamic of tectonic structures.

- Fieldwork (3 ECTS: 30 hours):

Pyrenees: thrust systems and compressional synsedimentary tectonics.

Iberian Chain: extensional synsedimenatry tectonics, thrust and folds, mesostructures.

- Tutorials. The student is free to ask any doubt related with the course.

5. Assessment system

To pass the course it will be necessary to:

1.- Participate in the laboratory and seminar activities and attend the field trips.

2.- Obtain a grade higher than 5 in the theoretical-practical exam.

3.- Obtain a grade higher than 5 in the practical exam.

ASSESSMENT OF STUDENTS THAT ATTEND CLASS REGULARLY:

a) Continuous assessment

1) Question papers/questions for oral answer. The students will have to answer to question papers or questions for oral answer, alone or in groups.
2) Laboratory exercises.
3) Field work (compulsory). Personal work will be evaluated.

b) Final assessment

4) Written exercises. A theoretical-practical exercise and a practical exercise (4-5 hours). The theoretical-practical exercise will be constituted by a test and/or a set of short answer questions and by long answer questions.

ASSESSMENT OF STUDENTS THAT DO NOT ATTEND CLASS REGULARLY:

It may be an oral (speaking) exam or a written exam. The evaluation may include any activity related to fieldwork.
1) oral exam or a written exam. Duration of the exam: 3-5 hours.
2) a practical exam where the student will have to solve laboratory and field exercises. Duration of the exam: 3-5 hours.

Assessment criteria:
- Written exam: 50 %
- Practical exam: 50 %

6. Sustainable Development Goals

4 - Quality Education