Structural Geology I

Code: 101047
ECTS Credits: 6

<table>
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<tr>
<th>Degree</th>
<th>Type</th>
<th>Year</th>
<th>Semester</th>
</tr>
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<tr>
<td>2500254 Geology</td>
<td>OB</td>
<td>3</td>
<td>1</td>
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</tbody>
</table>

Contact

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Email: MariaLuisa.Arboleya@uab.cat

Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Albert Griera Artigas

Prerequisites

It is recommended to have passed the subject "Fonaments de Geologia" and taken the course "Geological Cartography".

Objectives and Contextualisation

This subject deals with basic aspects of Structural Geology, including the study of stress, stress-strain relationships and the generation of brittle deformation structures. It is dedicated to the study of the structures originated by brittle deformation of rocks: faults and joints, and to salt tectonics.

Competences

- Display understanding of the size of the space and time dimensions of Earth processes, on different scales.
- Draw up and interpret geological maps and other means of depicting geological information (columns, correlation frames, geological cross-sections, etc.)
- Learn and apply the knowledge acquired, and use it to solve problems.
- Obtain information from texts written in other languages.
- Process, interpret and present field data using qualitative and quantitative techniques, and suitable computer programmes.
- Recognise, depict and reconstruct tectonic structures and the processes that generate them and relate types of rocks and structures to geodynamic environments.
- Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
Learning Outcomes

1. Discern the deformation processes on different scales.
2. Draw up structural subsoil models, based on geological cross-sections and three-dimensional block diagrams.
3. Formulate and verify hypotheses of a structural and tectonic nature.
4. Interpret the mechanical behaviour of geological materials in accordance with physical parameters.
5. Learn and apply the knowledge acquired, and use it to solve problems.
6. Obtain information from texts written in other languages.
7. Process, interpret and present structural data.
8. Recognise and depict the principal tectonic structures.
9. Relate deformation structures to tectonic stress.
10. Relate the principal tectonic structures to structural and petrogenetic processes.
11. Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
12. Synthesise and analyse information critically.
13. Work independently.

Content

PROGRAM

Unit 1. STRUCTURAL GEOLOGY. Structural geology and tectonic: concepts and scales of study. Typology of structural data and structural analysis. Experimentation in Structural Geology.


Unit 3. DEFORMATION. Concepts of deformation and strain, its components. Homogeneous and heterogeneous deformation.

Unit 4. RHEOLOGY. Relationships between stress and deformation. Elasticity, plasticity and viscosity: rheological models.


Unit 10. NORMAL FAULTS. Extensional faults: their geometry. Normal faults systems. Rift formation and metamorphosed rocks.

Unit 11. STRIKE SLIP FAULTS. Geometry of strike slip faults. Terminations of strike slip faults. Transfer and transform faults.


PRACTICE PROGRAM
- LABORATORY


II. Stress Mohr circle. Calculation of the state of stress from "in-situ" measurements.

III. Experimental deformation. Obtention of the stress-deformation curve from experimental data: material properties.
IV. Interpretation of graphs on the rheology of materials. The role of pressure, temperature, fluids and deformation rate in the rheology of rocks.

V. The fracture envelope. The use of Mohr circles to study the formation of faults and fractures. Physical parameters in the formation of fractures. Influence of the anisotropy in fracture development.

VI. Structures related to the displacement of thrusts and normal faults.

VII- VIII. Interpretation of geological maps and drawing of geological cross-sections.

IX. Analysis and interpretation of field data. Obtention of the stress field orientation from faults.

- FIELD WORK

Fault system of the Vallès-Penedès (1 day)

Fault recognition in the field and data collection. Kinematic criteria. Fault rocks. Interpretation of the structures and their representation in sketches and stereographic projections. Interpretation of the geodynamic context. Elaboration of a field report.

**Methodology**

This subject consists of a theoretical part (23 hours), in which the topics will be explained and some study guidelines will be provided. The content of each theory session will be guided by a suggested bibliography.

The laboratory practices (21 hours) will be taught in sessions of 2 hours and their content will be closely related to the topics covered in the theoretical part. The aim is to explain how to analyze and interpret the geological data, as well as the reading and interpretation of geological maps at different scales. The student will be expected to complete the laboratory practices under the supervision of the teacher. Any work not completed during the practice session will have to be completed autonomously by the student. Occasionally the exercises will be collected to be corrected and evaluated.

The field work will consist of a day trip to study the Vallès-Penedès fault system. Attendance at the field trip is mandatory to pass the subject. Before the practice, the students will elaborate a summary based on bibliography, on the location and main structural elements of the zone.

The practice will consist in the observation and explanation of the outcrops, followed by the data collection by the student. During the laboratory practice session, the data will be analyzed and interpreted, and guidelines for the preparation of the field report will be provided.

### Activities

<table>
<thead>
<tr>
<th>Title</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: Directed</td>
<td></td>
<td></td>
<td>12, 5, 1, 3, 4, 9, 10</td>
</tr>
<tr>
<td>Field work</td>
<td>7</td>
<td>0.28</td>
<td>12, 5, 2, 3, 7, 8, 9, 11, 13</td>
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<tr>
<td>Laboratory Practices</td>
<td>21</td>
<td>0.84</td>
<td>12, 5, 2, 3, 4, 6, 7, 9, 11, 13</td>
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<tr>
<td>Theory</td>
<td>23</td>
<td>0.92</td>
<td>12, 5, 1, 3, 4, 9, 10</td>
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Type: Autonomous

<table>
<thead>
<tr>
<th>Study, reading of bibliography and use of the Virtual Campus</th>
<th>32.5</th>
<th>1.3</th>
<th>1, 3, 4, 6, 9, 10, 13</th>
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</thead>
<tbody>
<tr>
<td>Treatment and interpretation of structural data and interpretation of geological maps</td>
<td>44.5</td>
<td>1.78</td>
<td>12, 5, 2, 7, 8, 11</td>
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</table>

### Assessment

Degree of compulsory nature of face-to-face teaching

In order for a student to be evaluated, the following minimum requirements must be met:

- Attend to the 80% of the theoretical sessions
- Attend to the 80% of the laboratory practices.
- To attend the field trip.

### Evaluation

Two partial exams of theoretical and practical content will be carried out. The evaluation will be completed with the evaluation of the other activities in the manner indicated below.

Assessment system for the acquisition of skills and qualifications system:

- Evaluation of laboratory practices by presenting a dossier (10%)
- Correction of practical exercises (10%)
- Evaluation of a fieldwork report (20%)
- Partial and final exams based on the theoretical and practical contents (60%)

Only the activities evaluated through partial exams are recoverable. Students must take the exam for all those activities not passed during the course. The recovery will be made through an examination.

If a student has carried out evaluation activities that exceed 35% of the total of the subject, he / she could not be graded as NOT PRESENTED.

### Assessment Activities

<table>
<thead>
<tr>
<th>Title</th>
<th>Weighting</th>
<th>Hours</th>
<th>ECTS</th>
<th>Learning Outcomes</th>
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<tr>
<td>Correction of practical exercises</td>
<td>10%</td>
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<td>0.04</td>
<td>12, 5, 1, 2, 4, 7, 8, 10, 11</td>
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<tr>
<td>Dossier of laboratory practices</td>
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<td>1</td>
<td>0.04</td>
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<td>Examination to recover the first and/or second exams</td>
<td>máx. 60%</td>
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<td>0.12</td>
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<tr>
<td>Field Work Memory</td>
<td>20%</td>
<td>11</td>
<td>0.44</td>
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<td>First partial exam of theoretical and practical contents</td>
<td>30%</td>
<td>3</td>
<td>0.12</td>
<td>1, 3, 4, 6, 8, 9, 10, 11</td>
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<tr>
<td>Second partial exam of theoretical and practical contents</td>
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<td>3</td>
<td>0.12</td>
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Bibliography


