Universitat Autònoma de Barcelona

2022/2023

Structural Geology II

Code: 101046
ECTS Credits: 6

Degree	Type	Year	Semester
2500254 Geology	OB	3	2

Contact

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Use of Languages

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

Other comments on languages

Although the common language of the subject is Catalan, the use of scientific terminology in English is promoted

Teachers

Elena Druguet Tantiña
Eduard Saura Parramon

Prerequisites

To have passed the subjects "Fundamentals of Geology" and "Work of Field of Regional Geology" of the first course of the Degree of Geology and of first and second year respectively of the double degree in Environmental Sciences and Geology.

Objectives and Contextualisation

To recognize, identify and interpret ductile deformation structures and their association in different tectonic contexts. This will be done both from a theoretical (genesis of structures) and analytical point of view (real structures). Emphasis will be placed on the student's acquisition of the ability to use the appropriate terminology of structural geology and the acquisition of skills to represent the structural characteristics throughout different methods of graphic representation (maps, cross-sections, detail schemes, stereographic projection and other specific techniques).

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.
- 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.
- Synthesise and analyse information critically.
- Use concepts from physics when solving problems in geology.
- Work independently.

Learning Outcomes

1. Discern the deformation processes on different scales.
2. Draw up geological maps of structurally complex regions and geological cross-sections.
3. Draw up structural subsoil models, based on geological cross-sections and three-dimensional block diagrams.
4. Formulate and verify hypotheses of a structural and tectonic nature.
5. Interpret the mechanical behaviour of geological materials in accordance with physical parameters.
6. Learn and apply the knowledge acquired, and use it to solve problems.
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

BLOCK 1

Topic 1: REVIEW OF CONCEPTS. CONTINUOUS DEFORMATION

Topic 2: HOMOGENEOUS DEFORMATION IN 2D

Topic 3: 2D HETEROGENIC DEFORMATION

Topic 4: DETERMINATION OF STRAIN IN 2D

Topic 5: DEFORMATION IN 3D

Topic 6: DEFORMATION OF ROCKS AT CRYSTALLINE SCALE

BLOCK 2

Topic 7: GEOLOGICAL IMPLICATIONS OF DEFORMATION

Topic 8: FOLIATIONS AND LINEATIONS

Topic 9: FOLDS

Topic 10: FOLDING

Topic 11: BOUDINAGE STRUCTURES

Topic 12: SUPERPOSITION STRUCTURES

Topic 13: SHEAR ZONES

BLOCK 3

Topic 14: TECTONIC REGIMES AND DEFORMATION PARTITIONING
Topic 15: STRUCTURAL ASSOCIACIONS IN INTERNAL OROGENIC DOMAINS. TECTONOMETAMORPHIC BELTS

CLASSROOM PRACTICES

Practice 1: Homogeneous deformation through coordinate transformation equations

Practice 2: The Mohr circle for finite homogeneous deformation

Practice 3: Homogeneous and heterogeneous deformation in 2D; pure shear and simple shear

Practice 4: Methods for determination of deformation: (1) Rf / Φ, (2) Method of Fry

Practice 5: Geological cutting through a strip of folds with cleavage

Practice 6: Folds in stereographic projection and Fleuty classification

Practice 7: Morphology of folds and classification of Ramsay

Practice 8: Polyphase deformation

Practice 9: Shear zones

Practice 10: Interpretation of structures based on photographs

FIELD PRACTICES

Tectonic structures in Cap de Creus (2 field trip days)

-First day: Cadaqués-Guillola-Puig Culip. Recognition and elaboration of cross-sections and structural schemes of zones with folds and associated foliations.

- Second day: Puig Culip - Culleró. Recognition and detail mapping of areas with folds and associated foliations in domains of intense metamorphism and magmatic activity. Relationships tectonics/metamorphism/magmatism. Shear zones.

Methodology

A combined approach between the theoretical approach (block 1) and the most descriptive (block 2) with a continuous feedback between the reference to the undeformed state (original geological object) and the reference to the deformed state (real structure). This approach applies to the whole course, so that the concepts explained in theory, practices and in the field are interrelated continuously.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes

Type: Directed			
Classroom exercises	12	0.48	2, 7
Field practices (field excursions)	14	0.56	1, 2, 5, 7, 8, 10, 11, 13
Lectures	25	1	1, 5, 10
Type: Autonomous			
To learn the theoretical and practical concepts complemented with bibliographic information, complementary practical works	84	3.36	12, 1, 4, 5, 10, 11, 13

Assessment

The final assessment and qualification will be based on the sum of the evaluations of (1) practice dossier, (2) field work, (3) theoretical-practical test of Block 1 and (4) the examination of Blocks 2 and 3. This gives 4 notes from which the weighted average will be obtained based on the specific weight of each of the parts (proportional to the number of hours spent).

To pass the subject via continuous evaluation, it will be necessary to have a minimum average mark of 5 and have done all the tests, participated in the filed trips and delivered all course works within the established deadlines. To average different parts a minimum mark of 3.5 is required for each part. In no case will the student be able to pass the subject if he has not carried out the field trips or if he has not presented the classroom practices and the dossiers.

Resit: If these requiremenst are not fullfilled, or if the resulting final average is less than 5, a resit test can be done on the date of the final evaluation. In order to be able to attend the resit exam, the student must have been previously evaluated of continuous assessment activities that are equivalent to 2/3 of the final mark. The recoverable activities in this final examination will be the activities (3) and (4). Students approved via continuous evaluation but who wish to improve their mark may choose to do so on the same date as the final assessment.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of classroom practices	15%	4	0.16	6, 7, 8
Evaluation of field works	15%	5	0.2	6, 1, 2, 7, 8, 10, 11, 13
Exam of contents of Blocks 2 and 3	35%	3	0.12	12, 6, 1, 2, 3, 4, 5, 7, 8, 10, 13
Theoretical-practical test of the contents of Block 1, with availability of notes and teaching materials of all kinds	35%	3	0.12	12, 6, 1, 4, 5, 9, 11, 13

Bibliography

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Lisle, R.J. 2004. Geological Structures and Maps: 3rd Edition. Elsevier.

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Twiss, R.J., Moores, E.M. 1992. Structural geology. Freeman. (2nd edition 2007, Macmillan).

Van Der Pluijim, B., Marshak, S. 2003. Earth Structure. McGraw-Hill.

Software

No specific software will be used