Universitat Autònoma de Barcelona

2019/2020

Geology of the Pyrenees Field Work

Code: 101028
ECTS Credits: 6

Degree	Type	Year	Semester
2500254 Geology	OB	4	2

Contact

Name: Antonio Teixell Cacharo
Email: antonio.teixell@uab.cat

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

Teachers

Eduard Remacha Grau

Prerequisites

The course involves fieldwork consisting on one side of detailed outcrop analysis and on the other of integration of observations in a broader geodynamic context. For this it will become necessary to have previous advanced knowledge of Stratigraphy and Sedimentology, Structural Geology, and geological mapping.

Objectives and Contextualisation

The aim of the course is the integrated study of an Alpine mountain belt such as the Pyrenees. Showing a moderate degree of deformation and exhumation, the Pyrenees can be considered as a school of geology about upper crustal structure and tectonics-sedimentation relationships.

The outcrop conditions of the Pyrenees make them the subject of numerous works, which yield ample information on structural and sedimentary geology, basin analysis, and landscape evolution. They are the subject of numerous field courses addressed to companies devoted to the exploration of natural resources, notable hydrocarbons.

To achieve the integrated study pretended in the course, we will carry out a transect perpendicular to the main structural belts, where we will analyze the tectonic and sedimentary evolution of the range from the internal to the external zones, as well as a longitudinal profile to the South Pyrenean foreland basin, where we will analyze the facies evolution from the proximal fluvial and deltaic systems to the deep sea fan turbiditic systems. This works aims to integrate concepts from different disciplines at different scales, with the objective to get a regional understanding of a major geological unit from diverse points of view.

Competences

- Describe stratigraphic successions and their temporal dimension and use correlation and interpretation techniques.
- 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.)
- Evaluate moral and ethical problems in research and acknowledge the need to follow professional codes of conduct.
- Identify and characterise minerals and rocks through instrumental techniques, determine their formation environments and know their industrial applications.
- 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.
- Show initiative and adapt to problems and new situations.
- Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
- Synthesise and analyse information critically.
- Work in teams, developing the social skills needed for this.

Learning Outcomes

1. Analyse tectonic structures in the field from a geometric point.
2. Discern the endogenous and exogenous processes related to the evolution of a geological unit.
3. Draw up and present fieldwork professionally and responsibly.
4. Establish temporal relationships between the different structures of a region.
5. Identify on the ground markers of the formation processes of minerals and rocks and establish their temporal relationships.
6. Identify on the ground the different types of tectonic structures, the temporal relationships between them and their significance.
7. Integrate outcrop-scale observations to make a regional-scale interpretation.
8. Interpret field observations from the perspective of sedimentology.
9. Interpret the physical conditions of their formation based on field criteria.
10. Interpret the structure of a region in a geodynamic context.
11. Learn and apply the knowledge acquired, and use it to solve problems.
12. Make field observations to draw up stratigraphic columns and correlation frames.
13. Obtain information from texts written in other languages.
14. Obtain, process and interpret field data from a regional, multidisciplinary perspective.
15. Recognise in the field the different types of rocks and relate them to the processes that originated them.
16. Relate sedimentary facies, on the ground, to the processes and environments in which they formed.
17. Show initiative and adapt to problems and new situations.
18. Suitably transmit information, verbally, graphically and in writing, using modern information and communication technologies.
19. Synthesise and analyse information critically.
20. Synthesise field data to present regional-scale findings.
21. Work in teams, developing the social skills needed for this.

Content

Theory

Structure and evolution of an Alpine mountain belt: the case of the Pyrenees

Facies distribution and evolution of the South Pyrenean foreland basin (from platform to deep sea environments)

Tectonics-sedimentation relationships in the foreland basins

Concepts and models applicable to hydrocarbon exploration

Seminar on biostratigraphy and paleontology of the southern Pyrenees

Seminar on geologic resources of economic value in the Pyrenees

Fieldwork

- Study of a N-S structural and sedimentary transect of the southern Pyrenees (western Axial Zone-Jaca basin-External Sierras)
- Study of an E-W longitudinal profile of the South Pyrenean foreland basin (Aínsa basin to Jaca basin).

Methodology

This course consists of a theoretical part in which the fundamental features of the tectonics and sedimentary geology of the Pyrenees mountain range and its southern foreland basin will be explained. This activity will serve as preparation for the fieldwork, and will contain an introduction to the necessary bibliography as well as the guidelines for the student to complete the learning autonomously. Students will have a part of the bibliographic material (scientific papers), maps and diagrams, and subsoil data, in the virtual campus, to be worked autonomously.

In addition, seminars will be held on aspects such as biostratigraphy and paleontology, or geological resources of economic interest.

Before the field camp, students must autonomously carry out a previous original report, which sets out the geological characteristics of the area to be visited, based on the essential bibliography and the information obtained from the theory classes and seminars, as well as the objectives of the field camp.

The field camp will last 6 days, in which outcrops and structural-sedimentological transects of the southern Pyrenees will be studied at the outcrop scale and at the orogen-basin scale. The fieldwork will include specific tasks that can be evaluated directly in the field (mapping, stratigraphic columns, etc.). It will be necessary to elaborate a field notebook where the observations and work done each day will be represented, which can also be reviewed and evaluated.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Directed fieldwork	42	1.68	1, 11, 17, 3, 4, 12, 6, 5, 7, 10, 9, 8, 14, 15, 16, 20, 21
Seminars	8	0.32	19, 2, 9, 13
Theory sessions	4	0.16	2, 10
Type: Autonomous			
Bibliographic study, use of virtual campus	31	1.24	19, 21
Elaboration of previous report	20	0.8	19, 13, 18
Processing field data	30	1.2	11, 4, 7, 10, 8, 14, 20

Assessment

The evaluation of the course will be based on several criteria, both referring to fieldwork and to activities to be performed outside the field.

Seminars will be subject to specific tests or assessment work. On the other hand, the previous report will be evaluated prior to departure to the field camp.

During fieldwork, the attitude and interest shown is an important component. In addition, it is also essential to carry out the observations and analyses on a regular basis and with a method, which conforms the field notebook. All this can be evaluated.

During the field camp, specific tasks will be performed that will be delivered and evaluated separately, such as geological maps and corresponding cross-sections, or stratigraphic columns and correlation panels.

After the field camp, the overall results of the work must be presented in a final report or poster that will be evaluated accordingly.

Since the course is based on fieldwork, attendance at the start is mandatory. In case of no attendance, the student will be considered as "not presented".

For a student to be evaluated, he must attend all theory sessions and seminars. The absences should be properly justified and documented. The non-delivery of any of the additional documents to fieldwork (previous report, exercises required and report / final poster) implies the failure to pass the course.

Students who have attended fieldwork but have not satisfactorily completed and failed the course, in the following year will have the option to repeat the fieldwork in the same area autonomously, and must deliver the corresponding field exercises, with demonstration of it fieldwork, and the final poster or report. The approval of these exercises will exempt from the repetition of the field camp.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Attitude during fieldwork, field notebook and final poster	30%	0	0	11, 4, 10, 20, 18
Previous report before the field camp	15%	10	0.4	19, 13, 18, 21
Seminar evaluation	10%	2	0.08	19, 2, 9
Structural and stratigraphic field exercises	45%	3	0.12	1, 11, 17, 3, 4, 12, 6, 5, 7, 10, 9, 8, 14, 15, 16, 20, 21

Bibliography

Book chapters (Pyrenees):

Gibbons, W. i Moreno, T. (eds.). 2002. The Geology of Spain. The Geological Society, London, 649 p.

Vera, J.A. (ed.). 2004. Geología de España. Mem. SGE-IGME, Madrid, 890 p.

Papers:

Nijman, W.J. i Nio, S.D. 1975. The Eocene Montañana delta (Tremp-GrausBasin, Southern Pyrenees). In: Rosell, J. & Puigdefàbregas, C. (eds) Sedimentary evolution of the Paleogene South Pyrenean Basin, Excursion Guidebook 19, IXth International Sedimentology Congress, Nice, 56 p.

Teixell, A. 1996. The Ansó transect of the southern Pyrenees: basement and cover thrust geometries. Journal of the Geological Society of London, 153: 301-310.

Teixell, A. 2000. Geotectónica de los Pirineos. Investigación y Ciencia, 288: 54-65.

Puigdefàbregas, C., Muñoz, J.A. i Vergés, J. 1992. Thrusting and foreland basin evolution in the Southern Pyrenees. In: K.R. McClay, (ed.). Thrust Tectonics. Chapman & Hall, London, p. 247-254.