

Degree programme	Type	Course
Geology	OP	3

Contact lecturer

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Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

This course presupposes a basic knowledge of the various branches of the fundamental geology acquired in the previous courses. We recommend revising the concepts and methods of structural geology.

Objectives

This optional course aims to make the student gain a knowledge of the dynamics of the Earth, with special emphasis on the interrelations between geologic processes of diverse nature and their integration in the frame of the plate tectonics. The course will incorporate concepts of diverse subjects acquired in the previous three years of the degree, and has the objective to enable the student to frame the Earth processes on a global scale.

Learning outcomes

- CM01 (Plan the set of techniques required to solve problems related to plate tectonics, large-scale sedimentation, and climate change.) Plan the set of techniques required to solve problems related to plate tectonics, large-scale sedimentation, and climate change.
- CM02 (Locate the areas of the planet with the greatest geological risk due to seismic activity by analysing current tectonic maps and the dynamics of the lithosphere.) Locate the areas of the planet with the greatest geological risk due to seismic activity by analysing current tectonic maps and the dynamics of the lithosphere.
- KM02 (Describe the endogenous and exogenous processes capable of modifying the physical geography of the planet and the distribution of geological materials in the Earth's crust, including the

interpretation of the geochemical and petrological record.) Describe the endogenous and exogenous processes capable of modifying the physical geography of the planet and the distribution of geological materials in the Earth's crust, including the interpretation of the geochemical and petrological record.

- KM03 (Differentiate the different inner layers of the Earth, its atmosphere and the hydrosphere.) Differentiate the different inner layers of the Earth, its atmosphere and the hydrosphere.
- SM01 (Apply the basic principles of geology (sedimentation, metamorphism, magmatism, deformation, and erosion) to reconstruct the chain of events of a place based on a deep geological section.) Apply the basic principles of geology (sedimentation, metamorphism, magmatism, deformation, and erosion) to reconstruct the chain of events of a place based on a deep geological section.

Contents

Theory

UNIT 1. EARTH CONSTITUTION AND DYNAMICS

- Internal structure of the Earth's globe. Sources of information (seismology).
- Continental and oceanic crust. Continental margins. The tectonic plates and their boundaries.
- Rheology of the lithosphere.
- Review of structural associations. Horizontal movements of the lithosphere: contractional, extensional and strike-slip systems. The tectonic inversion.
- Tectonics and topography: vertical movements of the lithosphere. Isostasy. Gravity anomalies Flexure of the lithosphere. Dynamic topography. Uplift and exhumation.

UNIT 2. PLATE TECTONICS

- Historical perspective. Continental drift and sea floor spreading.
- Divergent boundaries I: Mid-ocean ridges. Structure of the oceanic crust and ophiolites.
- Divergent boundaries II: Continental Rifts. Passive continental margins
- Oceanic fracture zones and transform faults.
- Convergent boundaries: Subduction Zones. Accretionary prisms. Magmatic arcs and backarcs.
- Collision of plates.
- Plate kinematics. The main plates today.
- Mechanics of plate tectonics. Driving forces.

UNIT 3. MAIN TECTONIC ELEMENTS OF THE EARTH

- Distribution of the main tectonic elements in the continents. .
- Study methods I: seismic refraction and reflection. Reflectivity patterns. .
- Study methods II: balanced geological cross-sections. .
- Cratons and Precambrian tectonics. Beginning of plate tectonics. .

- Subduction orogens: the Andes. .
- Collision orogens: the Paleozoic orogenies (Caledonian and Variscan), the Alpine-Himalayan system. .
- The Iberian plate and the western Mediterranean. .
- Intracontinental chains.
- Post-orogenic extension in mountain ranges. Gravitational collapse. .
- Tectonic subsidence and the different types of sedimentary basins.

Practical exercises

1- Exercises of plate tectonics

- Surface elevation and isostasy
- Rifting and tectonic subsidence
- Sea floor spreading
- Spherical rotation of plates

2- Interpretation of maps and seismic lines

- Interpretation of seismic reflection profiles of deformed regions
- Construction of geological cross-sections of representative tectonic styles
- Restoration and balancing of geological cross-sections

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Group tutorials	2	0.08	
Bibliographic study, use of virtual campus	45	1.8	

Practical sessions	25	1
Term paper on a tectonic plate or element of the Earth	30	1.2
Completion of practical exercises	15	0.6
Theory sessions	26	1.04

This course consists of a theoretical part (35 hours, in sessions of 1 hour, 2-3 times per week), in which the subjects will be explained and guidelines will be given so that the student can complete learning autonomously. Apart from the recommended bibliography, students will have additional material (graphics, scientific articles) on the virtual campus of the subject.

The laboratory work (10 hours) will be structured in sessions of 1-2 hours. It will consist in exercises related to practical work on plates tectonics, interpretation of map and seismic reflection profiles, and balancing cross-sections.

The student, individually or in small groups, will have to carry out an original work or term paper that may consist of the synthesis of a tectonic plate or of a regional tectonic unit, based on the bibliography and on data available on internet. The responsibility for research and selection of bibliography or resources will correspond to the student. The work will be presented in a written report and exposed orally in class.

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.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Presentation of original term paper	25%	3	0.12	CM02, KM02
Individual written tests (continuous evaluation)	65%	4	0.16	CM01, CM02, KM02, KM03, SM01
Presentation of a dossier of practical exercises	10%	0	0	SM01

The assessment will be on a continuous basis, based on written tests, on the work to deliver, and on a practical exercises dossier.

There will be two partial, individual and written tests, one at the end of blocks 1-2 and one at the end of block 3. To attend to the second partial, a student must at least have scored 3 in the first partial. The students that have not passed the average of the partial tests, or that want to raise the note, they can attend to one final exam, during the regular period of examinations. This final exam is will not be necessary for those who have passed the partials. 65% of the overall grade of the course will result from these individual written tests.

25% of the grade will be from the original work or term paper. The written and oral presentation of the work, the quality of the work carried out (originality, method, clarity, organization, conclusions extracted) and relevance of the bibliography or internet resources will be evaluated. 10% of the note will result from the dossier of practical exercises, which must reflect personal work.

Attendance to classes is mandatory.

For a student to be assessed he must attend at least:

- 60% of the theory sessions
- 80% of the practical sessions

If a student has carried out evaluation activities that exceed 35% of the total, it will appear as presented to the course. The failure to deliver any of the two additional documents to the written tests (work and dossier of practical exercises) will result in failing the course.

Evaluation activities

Presentation of a dossier of practical exercises

Presentation of original term paper

Individual written tests (continuous evaluation)

Bibliography

Kearey, P., Vine, F.J. 2009. Global tectonics. Blackwell Science, Oxford, 3rd ed.

Lowrie, W. 2007. Fundamentals of Geophysics. Cambridge University Press, 2nd ed.

Moores, E.M., Twiss, R.J. 1995. Tectonics. W.H. Freeman and Company, New York.

Software

No required software

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	first semester	afternoon
(PLAB) Practical laboratories	1	Catalan	first semester	afternoon