COURSE DATA

DATA SUBJECT

Code: 46742
Name: Interpretación de mapas geológicos e introducción a la cartografía geológica
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
2266 - Master's Degree in Applied Palaeontology	Facultat de Ciències Biològiques	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2266 - Master's Degree in Applied Palaeontology	Advanced scientific training	ELECTIVES

COORDINATION

RENAU PRUÑONOSA ARIANNA

SUMMARY

Geological cartography is a basic tool for representation and interpretation in Geology and other Earth Sciences. Given the character of Palaeontology, as a science halfway between Geology and Biology, the knowledge and application of geological cartography are essential in palaeontological work. In addition, the realization of geological maps requires in many cases palaeontological data, both for the dating of the rocks and for the identification of the mapped rock units and the structures that affect them. Geological maps are also essential to reconstruct the geological history of the region represented, so palaeontological data are crucial both for dating events that occurred in the region and the paleoenvironmental evolution of the area represented on the map. Finally, they are very useful when transmitting paleontological knowledge, either in publications, reports, presentations, ... and because they place paleontological material in its geological and geographical context.

The subject has been designed to provide basic training to students who have taken degrees in which subjects of this subject have not been included. Students of degrees such as Geology or Geological Engineering already have training in it, even at levels higher than those taught here.

At the beginning it deals with the origin, classification and identification of sedimentary rocks, and the minerals that compose them, since they are the main lithologies with which a paleontologist goes to face

the field and will find associated with paleontological sites on the maps. Already in the specific subject of geological cartography, it is about learning to interpret a geological map through the knowledge of the standard symbology that is used, representation of the relief, rocky bodies, deformation structures, ... using the method of bounded plans; It also deals with the basic geometric procedures that allow, from maps, calculations of relevant geological data (directions and inclinations of geological structures, thicknesses of rocky bodies, slopes, depths, ...). The interpretation of the map requires the realization of geological sections, the bases of which are also included in the subject, as well as the elaboration of stratigraphic columns and geological history, from the data of the map and the cuts. At the same time, the subject deals with the methods of construction of geological maps through field data, both lithological and paleontological, and with the help of photogeology. The approach is theoretical-practical, so that the continuous application of the theoretical bases that are taught has special relevance, so the practices have been perfectly coordinated with the theory; The development of the theoretical classes also includes the study of practical cases that help its understanding, as well as to develop the necessary skills for working with geological maps.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

There are no restrictions, since it is precisely a basic complement for those students who have not completed degrees in which this subject is taught in depth. Its program already includes the necessary bases for its understanding and application.

COMPETENCES / LEARNING OUTCOMES

2266 - Master's Degree in Applied Palaeontology

Access information tools from other areas of knowledge and use them appropriately.

Access the necessary information in the specific field of the subject (databases, scientific articles, etc.) and have sufficient judgement to interpret and use it.

Apply critical reasoning and argumentation based on rational criteria.

Apply science from a social and economic point of view, promoting the transfer of knowledge to society.

Apply the knowledge acquired and problem-solving abilities in new or unfamiliar situations within broader (or multidisciplinary) contexts related to the field of study.

Apply the research experience acquired to initiate the research phase of a PhD programme on biodiversity-related topics.

Apply the research experience acquired to tasks specific to the profession, both in the private sector and in public institutions.

Assess the need to complement their scientific, historical, language, IT, literature, social and human ethics education by attending lectures or courses and/or carrying out complementary activities, self-evaluating the contribution that these activities make to their overall education.

Assume an ethical commitment and sensitivity towards environmental problems and natural and cultural heritage.

Collect, represent and analyse data for the interpretation and production of geological maps and/or other forms of representation (stratigraphic columns, geological cross-sections, etc.) with a view to their inclusion in reports, scientific publications or other outputs.

Communicate and popularise scientific ideas.

Communicate conclusions and the knowledge and rationale supporting them to specialised and non-specialised audiences clearly and unambiguously.

Continue the learning process in a manner that is largely self-directed or independent.

Demonstrate in-depth understanding of the historical nature of the evolutionary process, both in its aspects of unrepeatability and contingency and in those linked to the fulfilment of laws of nature of all kinds and, therefore, of necessity.

Demonstrate intellectual curiosity and encourage responsibility for one's own learning.

Have an in-depth knowledge and understanding of the nature of biodiversity and its ecosystemic relationships both now and in the past.

Integrate knowledge and confront the complexity of making judgements based on information that, although incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of knowledge and judgements.

Know, understand and draw conclusions, applicable to the present time, about the crises of biological diversity, and their causes and consequences within the framework of actualism.

Know and understand the palaeodiversity of living beings, their ecosystemic relationships and the palaeogeographical distribution achieved by the main groups of living beings throughout the Earth's history.

Make quick and effective decisions in complex situations in their professional or research work, by developing new and innovative work methodologies adapted to the scientific/research, technological or professional field in which they carry out their activity.

Plan and manage available resources, taking into account the basic principles of quality, risk prevention, safety and sustainability.

Prepare, write and present reports and projects in public in a clear and coherent manner, defend them with rigour and tolerance and respond satisfactorily to any criticism that may arise from the presentation.

Produce all types of reports related to palaeontological matters clearly and concisely at an official or professional level (reports, grants, heritage impact reports, research projects, etc.)

Skillfully handle the field, laboratory and office techniques for the extraction, preparation, cataloguing, digital reconstruction, study and dissemination of microfossils and macrofossils.

Understand the fundamental principles of facies analysis in continental, transitional and marine depositional systems, and the use of fossils for palaeoenvironmental interpretation of the stratigraphic record.

Understand the nature of the fossil record in relation to the sedimentary process, the biostratinomic and phosildiagenetic phases of the process and the mechanisms of fossilisation.

Understand the nature of the stratigraphic record, its discontinuities, cycles and events, the different types of sedimentary basins, the factors controlling their infilling, the resulting three-dimensional geometries and stratigraphic correlations.

Use acquired knowledge as a basis for originality in the development or application of ideas, often in a research context.

Work efficiently in a professional or research team, acquiring the ability to participate in research projects and scientific or technological collaborations.

DESCRIPTION OF CONTENTS

Unit 1: Types of geological maps. Elements of a basic geological map (lithology, deformation structures and age). Concept of outcropping. Points. Linear elements and elements in two and three dimensions. Types of rocks in their context: Sedimentary rocks, metamorphic rocks, plutonic igneous rocks and volcanic igneous rocks. Forms of sedimentary bodies, forms of igneous intrusions, bodies forms of volcanic rocks.

Unit 2. Cartographic bases of representation in geological maps. Planimetric maps and topographic maps. Elements of a topographic map (scale, level curves, orientation, coordinates, ...) Topographic profile. Exercises.

Unit 3. Sedimentary materials. Stratification and lamination. Original spatial position of the clinoform stratification and cross-stratification. Parameters of a stratum (roof, base, thickness, polarity, contacts and nature of contacts). Sedimentary series. Types of formal stratigraphic units. Concept of facies. Mapping sedimentary facies. Exercises.

Unit 4. Representation of horizontal layers and symbology. Thickness calculation. Representation of inclined layers: Steering and diving, Rule of the "V". Horizontal layer lines. Determination and calculation on a map of the following parameters of an inclined layer: direction, direction and angle of diving, roof and base, power. Real and apparent mailboxes. Exercises.

Unit 5. Folding structures in stratified series and their cartographic representation. Concept and elements of a sheet. Types of folds: Antiform and syncline, anticlinal and synclinal. Shapes of folds in three dimensions. Normal and inverted folds. Tectonic causes of folds. Parameters (direction and direction) of the stresses generated by tectonic folds. Vergency. Cartographic symbology of the sheets. Exercises.

Unit 6. Fracture structures in stratified series and their cartographic representation. Types of fractures

(diaclasses and faults). Tectonic causes of fractures. Types and geometry of faults. Parameters (direction and direction) of the efforts generated by faults. Mapping fault interference. Mapping fault and layer interference in different positions. Mapping fault and fold interference mapping. Exercises

Unit 7. Mapping megastructures in regional tectonics. Rift-type zones of détente and tectonic trenches. Areas in compression contexts: rides and runoffs (concept of plinth and roof). Zones in shear contexts: Shear bands and transformation faults. Examples.

Unit 8. Cartographic representation of saline diapirs and intrusive rock bodies (batholiths, sill, ...). Tectonic relationship and sedimentation: Discordance (concept and types of discordances). Exercises.

Unit 9. Tectonic relationship and sedimentation. Unconformities. Definition and types. Exercises.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	10,00
Independent study and work	15,00
Preparation of lessons	10,00
Preparation for assessment activities	5,00
Resolution of case studies	5,00
Total hours	**45,00**

TEACHING METHODOLOGY

The subject has been planned so that it has a purely practical character, although the practical concepts are essential to carry it out.

In this way, students can apply theoretical knowledge extensively to problems and practical cases, and quickly acquire and consolidate the competences that are worked on in the subject. The proposed activities are, in summary: 1) Theoretical classes with application to problems and case studies, 2) practical classes, where problems posed are worked in depth, and simulated and real maps, 3) individual work that students develop outside the classroom, with problems and case studies raised both in theory and in practice, and that make them face alone and without external help, the problems that arise in the subject and 4) Field mapping. Where you can recognize field-scale structures and interpret geological mapping maps.

1. Theoretical classes. It is based on the master class, where students will previously have a script provided by the teacher. This will explain the essential parts of the theoretical content of the corresponding topic, emphasizing the most complex aspects and practical applications. During the same class the students will participate by performing exercises (simple case studies), which the teacher will propose after the corresponding explanation, and which can be done in collaboration with their classmates.
2. Practical classes. a) Classes focused on the study and recognition by students of the main sedimentary rocks and the minerals that form them. b) Classes designed to apply in an extensive way what was seen in the theoretical classes, with map problems, first topographic and then geological, with structures in increasing difficulty, from simple simulated cases to real maps. These practices are linked to concepts taught in the theoretical class.
3. Self-employment. The problems, case studies and maps that arise in the theory classroom and in the practices, then must continue as autonomous non-presential work, through the approach of exercises to be carried out by the students outside the classroom. These exercises will be given to the next class or practice for evaluation and will be part of the final grade.
4. Field mapping. It takes 2 field trips to work geological mapping in situ, recognizing and describing structures at field scale.

EVALUATION

The evaluation of the theoretical and practical aspects of the subject will be carried out through a written exam in the classroom, where both the theoretical and practical concepts of the subject will be evaluated.

The field trips (field mapping), will be evaluated in the field, in situ, with the realization of exercises that the teaching staff will explain and facilitate to the students.

Subject evaluated	Percentage of the final grade (%)	Maximum value in the final grade (points)	Minimum pass value (points)
Theory and practical exercises	50	5	5
Field	25	2,5	5

Class problems	15	1,5	5
Continuous evaluation	10	1	----

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