VNIVERSITAT DE VALÈNCIA

Course Guide
44301 Geological cartography for palaeontologists

COURSE DATA

Data Subject	
Code	44301
Name	Geological cartography for palaeontologists
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
2200 - M. U. en Paleontología Aplicada	Faculty of Biological Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
2200 - M. U. en Paleontología Aplicada	3 - Advanced scientific training	Optional

Coordination

Name	Department
RENAU PRUÑONOSA, ARIANNA	356 - Botany and Geology

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 prerequisites, 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.

It is necessary for the students to acquire a set of drawing and calculation materials, which the teaching staff will notify in time for the students to take to class.

OUTCOMES

2200 - M. U. en Paleontología Aplicada

- Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.
- Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.
- Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

- Students should demonstrate self-directed learning skills for continued academic growth.
- Be able to access to information tools in other areas of knowledge and use them properly.
- To be able to assess the need to complete the scientific, historical, language, informatics, literature, ethics, social and human background in general, attending conferences, courses or doing complementary activities, self-assessing the contribution of these activities towards a comprehensive development.
- Be able to apply the research experience acquired to professional practice both in private companies and in public organisations.
- Be able to communicate and disseminate scientific ideas.
- Be able to apply the research experience acquired to begin the research phase of a doctoral programme in the field of biodiversity.
- Ser capaces de trabajar en equipo con eficiencia en su labor profesional o investigadora, adquiriendo la capacidad de participar en proyectos de investigación y colaboraciones científicas o tecnológicas
- Ser capaces de realizar una toma rápida y eficaz de decisiones en situaciones complejas de su labor profesional o investigadora, mediante el desarrollo de nuevas e innovadoras metodologías de trabajo adaptadas al ámbito científico/investigador, tecnológico o profesional en el que se desarrolle su actividad.
- Aplicar el razonamiento crítico y la argumentación desde criterios racionales.
- Aplicar la Ciencia desde la óptica social y económica, potenciando la transferencia del conocimiento a la Sociedad.
- Capacidad para preparar, redactar y exponer en público informes y proyectos de forma clara y coherente, defenderlos con rigor y tolerancia y responder satisfactoriamente a las críticas que pudieren derivarse de su exposición.
- Proyectar la inquietud intelectual y fomentar la responsabilidad del propio aprendizaje.
- Asumir el compromiso ético y la sensibilidad hacia los problemas medioambientales, hacia el patrimonio natural y cultural.
- Conoce la naturaleza del registro estratigráfico, sus discontinuidades, los ciclos y eventos, los diferentes tipos de cuencas sedimentarias, los factores que controlan su relleno, las geometrías tridimensionales resultantes y las correlaciones estratigráficas.
- Recoger, representar y analizar datos para la interpretación y realización de cartografías geológicas y/o otros modos de representación (columnas estratigráficas, cortes geológicos, etc.) con vistas a su implementación en informes, publicaciones científicas u otros resultados.
- Elaborar de una forma clara y concisa, todo tipo de memorias relacionadas con la temática paleontológica a nivel oficial o profesional (informes, subvenciones, memorias de impactos patrimonial, proyectos de investigación, etc.)

LEARNING OUTCOMES

-Identify from visu and in the field the most common types of rocks, with special attention to sedimentary rocks.

-Interpret an advanced geological map, making a geological cut and recognizing its geological history.

-Recognize on the geological map of the area the different structures that can be encouraged in the field, identify their spatial and temporal relationships.

-Develop skills in the realization of the techniques of geological cartography and possible applications to Paleontology.

-Know how to perform simple geometric calculations on the geological map for interpretation of parameters geological studies relevant to paleontological and geological research.

-Locate yourself in the field by means of the topographic map and using a GPS.

-Know the importance of Paleontology in the development of geological cartography.

-Learn the use of geological maps in the representation of research results and scientific communication.

DESCRIPTION OF CONTENTS

1. Cartography for Palaeontologist II

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.
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.
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.

2. Cartography for Palaeontologist

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. Examples and 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). Examples of mapping discordances.
Unit 9. Procedural guide of geological information in a paleontology work. Identification of facies. Facies cartography. Sedimentary column. Palinspastic correlation. Representation of paleocurrents and/or paleopending. Determination and cartographic representation of sedimentary environments. Analysis of examples.

WORKLOAD

ACTIVITY	Hours	% To be attended
Laboratory practices	22,00	100
Theory classes	8,00	100
Development of individual work	10,00	0
Study and independent work	10,00	0
Readings supplementary material	5,00	0
Preparation of evaluation activities	5,00	0
Preparing lectures	5,00	0
Preparation of practical classes and problem	5,00	0
Resolution of case studies	5,00	0
TOTAL	**75,00**	

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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Basic

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Additional

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