VNIVERSITAT DE VALÈNCIA

Course Guide
44293 Palaeoecology, palaeoclimatology and palaeobiogeography

COURSE DATA

Data Subject	
Code	44293
Name	Palaeoecology, palaeoclimatology and palaeobiogeography
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2024 - 2025

Study (s)

Degree	Center	Acad. year	Period
2200 - Master?s Degree in Applied Palaeontology	Faculty of Biological Sciences	1	First term

Subject-matter

Degree	Subject-matter	Character
2200 - Master?s Degree in Applied Palaeontology	1 - Fundamentals of palaeontology	Obligatory

Coordination

Name	Department
FERRON JIMENEZ, HUMBERTO GRACIAN	356 - Botany and Geology

SUMMARY

The distribution of the living beings on Earth and the processes that have originated it and modified them are the scope of study of biogeography. Biogeography can be divided into two clearly separated areas: on the one hand, ecological biogeography, which deals with short-term, smaller-scale time periods; with local, within-habitat or intracontinental issues; and mainly with species or subspecies of living animals or plants, and on the other hand, historical biogeography, which analyses long-term evolutionary periods; with larger areas, sometimes global; and often with taxa above the level of the species and with taxa that may currently be extinct.

The limiting mechanisms of the distribution of present and past organisms are intimately related to ecological and climatic aspects, in addition to the geological and biological "engines" of the planet, such as plate tectonics (geology) and evolution (biology).

From an integrative perspective and with a view to the solid current basis derived from biogeography-ecology-geology, in this course we study those aspects that bring together in a single framework the biogeographic, ecological and climatic issue, from an actualist perspective, but with the aim of understanding and understanding the changes of the past as a result of this interaction.

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 enrollment restrictions with other subjects. The subject is mandatory and is taken in the first semester of the master's program.

2200 - Master?s Degree in Applied Palaeontology

- 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.
- Students should possess and understand foundational knowledge that enables original thinking and research in the field.
- Be able to access to information tools in other areas of knowledge and use them properly.
- 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 plan and manage the resources available taking into account the basic principles of quality, risk prevention, safety and sustainability.
- 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 acceder a la información necesaria en el ámbito específico de la materia (bases de datos, artículos científicos, etc.) y tener suficiente criterio para su interpretación y empleo.

- Aplicar el razonamiento crítico y la argumentación desde criterios racionales.
- 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.
- Asumir el compromiso ético y la sensibilidad hacia los problemas medioambientales, hacia el patrimonio natural y cultural.
- Conocer y comprender en profundidad la naturaleza de la biodiversidad y sus relaciones ecosistémicas tanto en la actualidad como en el pasado.
- Conocer la naturaleza del registro fósil en relación con el proceso sedimentario, las fases bioestratinómicas y fosildiagenéticas del proceso y los mecanismos de fosilización.
- Conocer y entender la paleodiversidad de los seres vivos, sus relaciones ecosistémicas y la distribución paleogeográfica alcanzada por los principales grupos de seres vivos a lo largo de la historia de la Tierra.
- Conocer, entender y extraer conclusiones, aplicables al momento actual, sobre las crisis de diversidad biológica, sus causas y consecuencias en el marco del actualismo.
- Comprender en profundidad la naturaleza histórica del proceso evolutivo, tanto en sus aspectos de irrepetibilidad y contingencia, como en aquellos vinculados al cumplimiento de leyes de la naturaleza de toda índole y, por tanto, de necesidad.
- Conocer los principios fundametales del análisis de fácies en sistemas deposicionales continentales, transicionales y marinos, y el uso de los fósiles para la interpretación paleoambiental del registro estratigráfico.
- Conocer y entender en profundidad la Geología regional de España y de zonas periféricas, y en particular de la Comunitat Valenciana, conociendo en detalle los principales hitos paleontológicos representados en los yacimientos de la Península Ibérica y el norte de África.
- Conocer y entender las causas del cambio climático y los proxies (estudio de diatomeas, foraminíferos, anillos de crecimiento de árboles, núcleos de hielo, datos del clima actual, etc.) usados para la caracterización de climas del pasado.

- To know and understand the paleodiversity of living beings, their ecosystemic relationships, and the paleogeographic distribution of the main groups of living beings throughout Earth's history.

- To deeply comprehend the historical nature of the evolutionary process, both in its aspects of irrepeatability and contingency, as well as those linked to the fulfillment of laws of nature of all kinds and, therefore, of necessity.

- To know the fundamental principles of facies analysis in continental, transitional, and marine depositional systems, as well as the use of fossils for the paleoenvironmental interpretation of the stratigraphic record.

- To have a profound understanding of the regional Geology of Spain and peripheral areas, particularly the Valencian Community, with detailed knowledge of the main paleontological landmarks represented in the deposits of the Iberian Peninsula and North Africa.

- To know and understand the causes of climate change and the *proxies* used for the characterization of past climates.

DESCRIPTION OF CONTENTS

1. Paleoecology

Definition and basic concepts of (paleo)ecology, ecosystem interactions (abiotic and biotic), paleoenvironmental inferences, methods in paleoecology, paleoecology in a temporal and evolutionary context.

2. Paleoclimatology

Concepts, history of paleoclimatology, causes of climate change, paleoclimatic records (historical, glacial, biological...), paleoclimatology: history of climate on Earth since its origins.

3. Paleobiogeography

Historical biogeography and ecological biogeography. Distribution patterns: limiting factors. Communities and ecosystems. Biodiversity patterns. Planetary mechanisms as drivers of biogeography: the geological driver (plate tectonics) and the biological driver (evolution). Patterns of life in the present (dispersion, vicariance, and endemism) and their reflection in the past. Ice and change.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	18,00	100
Laboratory practices	12,00	100
Study and independent work	45,00	0
TOTAL	**75,00**	

TEACHING METHODOLOGY

Theoretical face-to-face classes will be taught to provide fundamental knowledge covering the basic aspects of the program. In addition, guided seminars may be conducted by the professor, consisting of detailed study of specific examples or discussion on certain aspects of the program.

Two laboratory practical sessions will be conducted, during which the necessary information will be provided for students to carry out their own paleoecological, paleoenvironmental, and paleobiogeographic interpretations. These practical sessions will serve to reinforce the key concepts covered in the theoretical classes.

EVALUATION

The evaluation of the theoretical and practical aspects of the subject will be done through an exam, which will eliminate material whenever the passing grade is achieved or exceeded. The exercise will consist of three sections with 3 essay questions and 3 short-answer questions, one short and one essay question for each of the thematic blocks (sections) of the course, namely: a) Paleoecology, b) Paleoclimatology, and c) Paleobiogeography.

Out of the 6 questions given, students must answer 3 under the following conditions:

1. From each block-section, at least one question, whether short or essay, must be answered.
2. Only answering short-answer questions is not allowed.

Each section (a, b, and c) must be passed separately (a minimum score of 5 out of 10 in each); failing in one section means not passing the exam, except in the case of compensation: if one section has a grade between 4.0 and 4.9, it can be compensated if the final calculation of the overall exercise grade is at least a 5. If two sections have grades between 4 and 4.9, no compensation is possible, and the exam will not be considered passed, requiring the student to retake the entire exam in the next session. This exam represents 90% of the final grade for the subject.

Laboratory-cabinet practices, as well as attendance to theoretical classes, will be continuously evaluated. The continuous assessment will take into account attendance to theoretical and practical classes, and the participatory attitude of the students. This assessment represents 10% of the final grade.

Evaluation considerations for the 1st session:

1. All sections (a, b, c) are scored on a maximum grade of 10, and they are considered passed when the minimum passing value is achieved.
2. Continuous assessment is scored out of 10, and in order to be eligible to take the exam, the score for this component must be equal to or higher than 5.
3. The subject will be considered passed when a minimum grade of 5.0 points is obtained in the first three sections.

Evaluation considerations for the 2nd session:

If the final score of the evaluated aspects is lower than the minimum required points to eliminate material, the student will have to retake the section in which they did not reach a score of 5. In any other circumstance, the same considerations as those in the first session will be applied.

REFERENCES

Basic

- Cox, C.B., Moore, P.D., Ladle. R.J. (2016). Biogeography. An Ecological and Evolutionary Approach. Wiley Blackwell. 482p.

-Bottjer, David J. Paleoecology: past, present and future. John Wiley & Sons, 2016.

-Allmon, Warren, Warren D. Allmon, and David J. Bottjer, eds. Evolutionary paleoecology: the ecological context of macroevolutionary change. Columbia University Press, 2001.

-Cronin, Thomas M. Principles of paleoclimatology. Columbia University Press, 1999.

-Bradley, Raymond S. Paleoclimatology: reconstructing climates of the Quaternary. Elsevier, 1999.

Additional

- Cao, W., Zahirovic, S., Flament, N., Williams, S., Golonka, J., Dietmar Müller, R. 2017. Improving global paleogeography since the late Paleozoic using paleobiology. Biogeosciences 14, 54255439. https://doi.org/10.5194/bg-14-5425-2017.

-Chiarenza, A.A., Mannion, P.D., Farnsworth, A., Carrano, M.T., Varela, S. Climatic constraints on the biogeographic history of Mesozoic dinosaurs. Current Biology 32, 570585.