VNIVERSITAT DE VALÈNCIA

Course Guide

46746 Geochemistry and environmental palaeontology

COURSE DATA

DATA SUBJECT

Code: 46746
Name: Geochemistry and environmental palaeontology
Cycle: Master's Degree
ECTS Credits: 3
Academic year: 2025-26

STUDY (S)

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

SUBJECT-MATTER

Degree	Subject-matter	Character
2266 - Master's Degree in Applied Palaeontology	Palaeontology applied to the exploration of geological resources and to environmental studies	ELECTIVES

COORDINATION

BASTIDA CUAIRAN JOAQUIN

SUMMARY

The subject is aimed at the application of geochemistry and paleontology in the study of environmental problems throughout the geological record, as well as the use of geochemistry in the study and characterization of fossil materials, as well as rocks and geological formations that contain them. The purpose is the integration of paleontological and geochemical data in the analysis of palaeoenvironmental processes, from a local scale to a global scale, at different intervals of the geological record, and in different palaeogeographic settings

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 in the curriculum. However, it is convenient to have a minimum knowledge of geology, mineralogy and paleontology.

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.

Be familiar with, develop and manage georeferenced databases of elements from the geological and palaeontological record, as well as the software used for the spatial representation and analysis of these elements.

Communicate and popularise scientific ideas.

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

Conduct studies, applying the methods and techniques needed to preserve and manage palaeontological heritage.

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.

Develop experimental skills in the handling of laboratory material and equipment in palaeontology.

Have an in-depth knowledge and understanding of the regional geology of Spain and surrounding areas, particularly the Valencian Community, with detailed knowledge of the main palaeontological sites found in the Iberian Peninsula and North Africa.

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.

Interpret environmental and ecological variables of the past from the study of organism traces in the fossil record.

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 confidently handle the divisions of the geological time scale and the biostratigraphic scales constructed from different groups of biota in the fossil record.

Know and understand past biological events, as well as the zonations, in time and space, of biota in order to establish the relative stratigraphic position of sedimentary rocks from different geographical areas.

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 causes of climate change and the proxies used (diatom studies, foraminifera, tree growth rings, ice cores, current climate data, etc.) to characterise past climates.

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 fundamentals of the use of microfossils and macrofossils for the characterisation of geological deposits containing resources such as oil, gas, coal, peat, etc.

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

1. Fundamentals of Geochemistry

Phases and chemical components of geological materials. Geochemical cycle. Isotopic geochemistry. Stable isotopes: environmental applications. Radioactive isotopes: applications in dating. Non-isotopic dating methods. Composition of the atmosphere, hydrosphere, litosphere and biosphere.

2. Paleontology and environment

Using paleontological and geochemical data on environmental issues: environmental aspects.
Environmental problems of today. Using paleontology and geochemistry for the study of environmental problems.

3. Fossil record of the environment.

Environmental problems: the fossil record and environmental conditions. Paleoclimatic records. Global changes and cyclicality: contributions from paleontological data. Identification of orbital cycles with paleontological data. Geological periodicity of biotic events. Paleontology and isotope geochemistry.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	10,00
Seminar	2,00
Laboratory	18,00
Total hours	**30,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	0,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00

Total hours	**0,00**

TEACHING METHODOLOGY

The training activity will include:

1) lectures.

2) laboratory practices, office and computer room work, or eventually field testing work (simultaneous with field work of another subject).

3) personal work, including making individual reports.

4) supervised cooperative work in groups of practices or of seminar, leading to implementation of practical activities as well as development and / or presentation of results.

EVALUATION

Final test 50%

Reports of exercises and practices mandated 20%

Seminars reports 10%

Repports of bibliographic works or of chapters 20%

REFERENCES

- Mason B & Moore C,B (1983) Principles of Geochemistry John Wiley & Sons. - White W.M (2013) Geochemistry . John Wiley & Sons. - Condie K C 2011. Earth as an Evolving Planetary System . Academic Press (Elsevier). - Anguita, F (1988). Origen e historia de la Tierra. Ed. Rueda. - Uriarte, A (2003) Historia del clima de la Tierra. Vitoria : Eusko Jaurlaritzaren Argitalpen Zerbitu Nagusia. - Reguant S (2005) Historia de la tierra y de la vida, Ariel.

- Fairbroidge, Rhodes, Whitmore (1978) The encyclopedia of geochemistry and environmental sciences (Encyclopedia of earth sciences series) Van Nostrand Reinhold Co - John W. Valley and David R. Cole table Isotope Geochemistry, Reviews in mineralogy and geochemistry series, Volume 43 . Mineralogical Society of America. - Monroe, J. S., Wicander, R. & Pozo, M.(2008) Geología. Dinámica y evolución de la Tierra.. Ed. Paraninfo-CENCAGE Learning. - Ruddiman, W.F. (2001) Earths climate: past and future. New York, W.H.Freeman. - Dawson A.G (1992) Ice age

earth : late Quaternary geology and climate . Routledge - Wilson, R.C.L.; Drury, S.A.; Chapman, J.L. (2000) The great Ice Age. Climate change and life. Routledge, 2000.