Universidad Zaragoza

Academic Year/course: 2021/22

60377 - Paleontology and dynamics of the biosphere

Syllabus Information

Academic Year: 2021/22
Subject: 60377 - Paleontology and dynamics of the biosphere
Faculty / School: 100 - Facultad de Ciencias
Degree: 624 - Master's in Geology: Techniques and Applications
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

The Paleontology and dynamics of the biosphere expected results respond to the following approaches and objectives: The main objective of the course is for the student to understand the phenomenon of life on earth, its origin, evolution and diversification using paleontological data and large Data Bases.

The second objective is for the student to be able to propose predictive models related to various evolutionary, ecological and biogeographical aspects and to be able to interpret the dynamics of the biosphere at a local, regional and global scale.

These approaches and objectives are aligned with the following United Nations Sustainable Development Goals (SDGs) (https://www.un.org/sustainabledevelopment/), in such a way that the acquisition of the results of Learning the subject provides training and competence to contribute to some extent to its achievement:

-Goal 13: Climate Action

-Goal 14: Life under Water

-Goal 15: Life on Land

1.2. Context and importance of this course in the degree

This subject is part of the group of optional subjects of the Master in Geology (all of them taught in the second semester), in which part of the methods studied by the students will be applied in the compulsory subjects taught in the first semester ("Treatment, representation and geological data modeling","Methods and techniques in Geology" and "Scientific and technical communication").

This subject is recommended for the development of the contents of the subjects: "Climate changes, associated events and geological record" and "Integrated basin analysis"

1.3. Recommendations to take this course

It is advisable that the students have:

Basic knowledge of living and fossil organisms: microbiology, zoology, botany and general paleontology.

Basic knowledge of isotope chemistry and mineralogy.

Basic knowledge of ecology and evolution.

Basic knowledge of stratigraphy, geological and geodynamic mapping.

Basic knowledge in Office programs such as Excel. Also, the use of databases and basic statistics.

Some of the practice sessions will require the use of computers. It will be necessary to consult the bibliography in English.

2. Learning goals

2.1. Competences

Upon passing the subject, the student will be more competent to...

Basic and general competencies:

Being able to exchange and debate information from various sources of written, oral, numerical, graphic information ...

Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a context of research in geology and biodiversity.

Possess the learning skills to continue self-directed or autonomous study.

Use scientific English to obtain information both in libraries and on the web.

Being able to gather and integrate various types of evidence to formulate and test hypotheses, applying the scientific method in the framework of geological investigations.

Be able to propose conceptual and numerical models using the appropriate modeling tools.

Being able to propose conservation management models of current organisms through evolutionary, paleogeographic and paleoecological knowledge.

2.2. Learning goals

The student, to pass this subject, must demonstrate the following results ...

He understands the phenomenon life on earth, its origin and diversification and knows how to use paleontological data as a tool.

He knows how to recognize the different types of biological evidence in the geological record.

Knows and applies the main study techniques and can propose predictive models related to various evolutionary, ecological and biogeographic aspects.

Develops the ability to interpret the dynamics of the biosphere on a local, regional and global scale.

Develops the ability to interpret the morphological variation of fossil species and their adaptation to the environment and evolution.

Knows and applies the main methods of inference of kinship between organisms that lived in the past and current, and understands the relationships between systematics, phylogeny and paleobiogeography.

Learn about the contributions of paleontology to Ecology, Biogeography, Evolution, Astrobiology.

2.3. Importance of learning goals

By understanding the phenomenon of life on earth, its origin and diversification, and recognizing the different types of biological evidence in the geological record, predictive models related to various evolutionary, ecological, conservation and biogeographic aspects can be proposed.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must demonstrate that has achieved the expected learning outcomes through the following assessment activities

Continuous evaluation (ICR: Report, Questionnaire, Summary): Reports or Questionnaires of each block of the subject (90%); Field practices (10%). The final grade will be the weighted average of the grades obtained, according to the teaching hours covered by each block of the subject.

Global evaluation: The student who has not passed the continuous evaluation or opts for the global evaluation will take a written exam, unique and of a theoretical and practical nature (100%). It will be held on the dates provided for in the academic calendar of the Faculty of Sciences for the second semester.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

Master class: detailed presentation of the topics with the help of ICTs and active participation (face-to-face or virtual if necessary) of the students. Resolution of problems and cases: Approach and resolution of problems based on real or possible cases, with application of general or specific computer programs (face-to-face or virtual if necessary). Teaching work or seminars: presentation and sharing of work or case studies, prepared by the students and debate on the results obtained (face-to-face or virtual if necessary).

General methodological presentation
The methodology followed in this course is aimed at achieving the learning objectives. The course is divided into three sets of topics and a seminar. Students are expected to actively participate in class throughout the semester. Classroom materials will be available through Moodle and email communications if necessary. Classroom teaching materials include a repository of class notes used in class, the course syllabus, as well as other course-specific learning materials, including a discussion forum. More information about the course will be provided on the first day of class.
The learning process that has been designed for this subject is based on the following: the paleontological record in the past, analysis of forms, evolution of fossil associations and paleoenvironmental, paleoecological and paleobiogeographic

inferences.
The course has been divided into three units and a seminar that cover its contents, from the origin of life on earth to the contributions of paleodiversity reconstructions to geology, biology, ecology, evolution, etc. The seminar is dedicated to the contributions of terrestrial paleontology to interplanetary studies, such as the detection of fossil life on other planets - Astrobiology, although the seminar may vary depending on the interests of the students, for example the creation of companies. paleontological or special situations in which the knowledge of paleontology can be applied to certain cases of the dynamics of the biosphere, including the human.
The practices are synchronized with the theory, in them various techniques will be applied to solve problems of analysis of the biological record in the past, morphological and phylogenetic analysis, evolution of fossil associations, taphonomy, and paleoenvironmental, paleoecological and paleobiogeographic inferences.
The course has a teaching load that is broken down into the following types of teaching activities (Total 6ECTS):
1. Master class (2.1 ECTS): detailed exposition of the topics with the help of ICTs and active participation of the students.
2. Laboratory practices (3 ECTS): application of various techniques for solving problems based on real or possible cases, using general or specific computer programs.
3. Seminar (0.3 ECTS): exposition and discussion of the proposed topic.
4. Field practices (0.6 ECTS): application of techniques in field practice
In order to optimize the coordination between the theoretical and practical content, intensive sessions are planned in which a part of the session can be devoted to the more theoretical aspects, then moving on to its practical development.

4.2. Learning tasks

4.2. Learning activities
The paleontology and dynamics of the biosphere is a 6-credit course, which consists of 60 hours of theoretical practice, seminar and field practice that are distributed throughout the second semester.
The practices consist of problems that are solved in class, during the theoretical-practical sessions. Field practices consist of applying theoretical problems to practical cases in the field.

In the theoretical-type training activities, you can opt for NO-attendance if necessary and offer virtual classes. The same with seminars, and practical problem solving.

The teaching and assessment activities will be carried out on-site (face-to-face) unless, due to the exceptional health situation, the provisions issued by the competent authorities and by the University of Zaragoza provide for them to be carried out off-site (telematically), except for field practices.

4.3. Syllabus

Theory
· Contributions of paleontology to the knowledge of the biosphere and its dynamics: a historical vision.
· The phenomenon of life on Earth. The origin of life: The interpretation of the fossil record.
· The paleodiversity archives. Fossil conservation. Museum dynamics.
· Diversification and morphological and ecological disparity
· The evolution of the form of organisms.
· Phylogenetic inference and its application in Paleobiogeography
· Contribution of taphonomic analysis to the reconstruction of past ecosystems and paleobiodiversity
· Biosphere response to environmental disturbances at regional and global scale
· Periodicity on a geological scale of biotic events
· Use of paleontological data banks in the study of biodiversity and its dynamics
· Contributions in the fields of evolutionary ecology, macroecology and historical biogeography
· Seminar: selected content of a paleontological topic of interest
Practices
· Origin of the earth and appearance of the biosphere: Phenomenon and origin of life. Milestones I: land dynamics and evolution of life on earth
· Fossil preparation technique I
· Fossil preparation techniques II
· Analysis of growth and shape in paleontology
· Morphological characters: species and evolutionary patterns
· Phylogenetic systematics I.
· Phylogenetic systematics II.
· Data provided by taphonomy. Practical cases in palynology.
· Taphonomy and practical cases in terrestrial microfauna.
· Analysis of practical cases with microfossils I.
· Analysis of practical cases with microfossils II.
· Advanced techniques in the study of biodiversity II. Terrestrial microfauna databases.
· Advanced techniques in paleobiogeographic studies: land dynamics, biogeography and extinction

4.4. Course planning and calendar

Calendar of face-to-face or virtual sessions and presentation of works
The course will be taught in theoretical-practical sessions 3-4 hours long on Monday morning, they can be virtual if required.
The definitive schedules can be found on the website of the Faculty of Sciences. The practical classes are synchronized with the theory.
More information will be given on the class boards and in the Digital Teaching Ring (https://moodle2.unizar.es/add/) when available of this information.
Classes begin in the second semester, according to the calendar that is published on the website of the faculty.
Exam dates at the end of classes, according to the calendar published on the website of the faculty.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=60377