VNIVERSITAT DE VALÈNCIA

Course Guide
44312 Palaeodiversity and evolution of vertebrates

COURSE DATA

Data Subject	
Code	44312
Name	Palaeodiversity and evolution of vertebrates
Cycle	Master's degree
ECTS Credits	3.0
Academic year	2022 - 2023

Study (s)

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

Subject-matter

Degree	Subject-matter	Character
2200 - M. U. en Paleontología Aplicada	6 - Palaeodiversity	Optional

Coordination

Name	Department
MARTINEZ PEREZ, CARLOS	200 - Geology
MONTOYA BELLO, PLINIO	356 - Botany and Geology

SUMMARY

This subject, of a theoretical-practical nature, is taught in the second semester of the master's degree. It provides an overview of the fossil record of the main groups of vertebrates, including hominids. It provides information on the conservation processes that have given rise to their rich and diverse record, and introduces students to the morphological evolution of vertebrates, as well as the main facts of their palaeobiogeographical history. Finally, information will be provided on the main vertebrate palaeontological sites in the fossil record of the Iberian Peninsula and, especially, of the Valencian Community. The practical part includes visits to museums (such as the Museo Paleontologico de Alpuente) and, if possible, a visit to a vertebrate palaeontological site. It also deals with the observation and functional significance of the main morphological characters of bones and teeth, as well as the interpretation of taphonomic information. Furthermore, the techniques of excavation, preparation and conservation of vertebrate fossils are covered, including the treatment of sediment samples to obtain microvertebrates. In this way, the student will gain knowledge of the main techniques for the recovery of fossil vertebrates. Likewise, importance is given to attending lectures and seminars related to the subject.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

NO

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.
- 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.
- 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 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.

- 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.
- 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.
- Conocer y comprender en profundidad la naturaleza de la biodiversidad y sus relaciones ecosistémicas tanto en la actualidad como en el pasado.
- 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 y comprender los eventos biológicos del pasado, así como las zonaciones, en el tiempo y en el espacio, de las biotas en orden a establecer la posición estratigráfica relativa de las rocas sedimentarias de zonas geográficas divesas.
- Conocer y manejar con fluidez, las divisiones de la escala de tiempo geológico, y las escalas bioestratigráficas construidas a partir de diferentes grupos de biotas del registro fósil.
- Desarrollar las habilidades experimentales en el manejo de material y equipos de laboratorio en paleontología.

LEARNING OUTCOMES

- To understand the defining features of vertebrates and how these features influence their own preservation in the fossil record.

- To know the main groups of fossil vertebrates.

- To know the main facts of the evolutionary and biogeographical history of vertebrates.

- To know the application of vertebrates in biostratigraphy.

- To understand the role played by vertebrates in past ecosystems.

- Understand the place of hominids, and the human species in particular, in the history of life.

- To know the main sites of fossil vertebrates in the Iberian Peninsula and, especially, in the Valencian Community.

- To understand the importance of conserving this palaeontological heritage.

- To know the main palaeontological techniques of excavation, recovery, preparation and conservation of fossil vertebrates.

DESCRIPTION OF CONTENTS

1. Theoretical Block

Unit 1. Introduction to vertebrates. Biomorphodynamics and comparative anatomy of the skeleton. History of knowledge about fossil vertebrates.
Unit 2. Taphonomy of vertebrates. Types of sites. Exceptional conservation. Taphonomy and palaeobiology. Quantitative methods.
Unit 3. Origin of chordates. The first vertebrates: agnates. Ostracoderms.
Unit 4. Fishes: placoderms, acanthodians, chondrichthyans, osteichthyans (sarcopterygians and actinopterygians).
Unit 5. Adaptations to the terrestrial environment. Origin and diversification of the tetrapod model. Amphibians and origin of amniotes.
Unit 6. Reptiles. Synapsids (pelycosaurids and therapsids). Anapsids (chelonians). Diapsids. Marine and flying reptiles of the Mesozoic.
Unit 7. Dinosaurs. Saurischians (theropods and sauropodomorphs). Ornithischians. The great extinction of the Cretaceous-Tertiary boundary.
Unit 8. Birds. Origin and adaptation to the aerial environment. The large carnivorous flightless birds.
Unit 9. Mammals. Origin and Mesozoic mammals. The radiations of the Cenozoic.
Unit 10. Primates. Origin. Non-hominoid primates.
Unit 11. Hominids and hominoids of the Miocene. Homininae. Anatomical consequences of bipedalism.
Unit 12. Introduction to vertebrate palaeobiogeography.
Unit 13. Palaeoecology: Prehistoric vertebrates and terrestrial ecosystems. Estimates of body mass. Nutrition: isotopes and trace elements.
Unit 14. Fossil vertebrates of the Iberian Peninsula. Main sites in the Valencian Community. Patrimonial problems.
Unit 15. Vertebrate applications in biostratigraphy.

2. Practical Block

Practical 1. Anatomy of vertebrate bones and teeth.
Practical 2. Vertebrate taphonomy.
Practical 3. Techniques for the recovery and preparation of fossil vertebrates.
Practical 4. Field work.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	15,00	100
Other activities	7,00	100
Laboratory practices	6,00	100
Seminars	2,00	100
TOTAL	**30,00**	

TEACHING METHODOLOGY

- Lectures, given by the lecturer, to provide the basic knowledge and methodology to be used.

- Practical laboratory classes, focused on the application of some of the concepts introduced in the theoretical classes.

- A field practical, consisting of a visit to museums or palaeontological site, with a preliminary introduction by the teacher and, subsequently, a work or seminar by the students on the results of the visit.

- The set of knowledge covered in the theoretical and practical classes will be assessed by means of the development and public defense of a poster.

- Individual or group use of materials prepared or referenced by the teacher for the elaboration of work by the students. Students must carry out a theoretical work on a topic from a list of topics suggested by the teacher. It will be based mainly on bibliographical data without excluding the possibility of incorporating experimental data. The work carried out by the students will be dealt with in class in the form of seminars.

- Face-to-face tutorials, individual or in groups, with the lecturer to supervise the work carried out by the students.

- Participation in seminars developed by the students themselves, attendance at external seminars, conferences, visits to museums and other activities.

- Use of the virtual classroom as a communication tool.

EVALUATION

- Test (oral presentation) that are carried out, individually or in groups, throughout the semester for the evaluation of the technical competences of the subject, and whose contribution to the final grade may not exceed 70% of the total.

- Attendance and use of the classes

- Report on the practicals and field trips activities.

Assessment activities Weighting

Final exam 70%.

Practicals/laboratory/field work reports 20%

Continuous assessment 10%.

REFERENCES

Basic

- Benton, M.J. 1995. Paleontología y Evolución de los Vertebrados. Editorial Perfils, Lleida, 369 p
- Carroll, R.L., 1988. Vertebrate Paleontology and evolution. W.H. Freeman and Company, New York.
- Janvier, P. 1996. Early Vertebrates. Oxford Monographs on Geology and geophysics, 33. Oxford: Clarendon Press, 393 p.
- Long, J.A. 1995. The Rise of Fishes: 500 Million Years of Evolution. Johns Hopkins University Press, Baltimore, 223 pp.
- Lyman, R.L. 1994. Vertebrate Taphonomy. Cambridge University Press, 524 p.
- Weishampel, D.B., Dodson, P. & Osmólska, H. (eds.) (2nd ed.) 2004. The Dinosauria. University of California Press, Berkeley, 862 p.
- Szalay, F.S. & Delson, E. 1979. Evolutionary history of the primates. Academic Press, Inc., San Diego, 580 p.

Additional

- Agustí, J. & Antón, M. 2002. Mammoths, Sabertooths, and Hominids. 65 million years of mammalian evolution in Europe. Columbia University Press, New York, 313 p.
- Belinchón, M., Peñalver, E., Montoya, P. & Gascó, F. 2009. Crónicas de Fósiles. Las colecciones paleontológicas del Museo de Ciencias Naturales de Valencia. Ayuntamiento de Valencia, 544 p.
- Lockley, M.G. 1993. Siguiendo las huellas de los dinosaurios. McGraw-Hill/Interamericana de España, Madrid, 307 p.