VNIVERSITAT DE VALÈNCIA

Course Guide
46754 Palaeodiversity and Evolution of Vertebrates

COURSE DATA

DATA SUBJECT

Code: 46754
Name: Palaeodiversity and Evolution of Vertebrates
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	Palaeodiversity	ELECTIVES

COORDINATION

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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 enrollment restrictions have been specified with other subjects in the curriculum.

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.

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.

Communicate and popularise scientific ideas.

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

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 nature of biodiversity and its ecosystemic relationships both now and in the past.

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 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.

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 nature of the fossil record in relation to the sedimentary process, the biostratinomic and phosildiagenetic phases of the process and the mechanisms of fossilisation.

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. Theoretical Block

Unit 1. Introduction to vertebrates. Biomorphodynamics and comparative anatomy of the skeleton. History of knowledge about fossil vertebrates.

Unit 2. Origin of chordates. The first vertebrates: agnathans. Ostracoderms.

Unit 3. Gnathostomes I: placoderms, acanthodia and chondrichthyans.

Unit 4. Gnathostomes II: osteichthyians (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 (pelycosaurs and therapsids). Anapsids (chelonians). Diapsids. Marine and flying reptiles of the Mesozoic.

Unit 7. Saurischian Dinosaurs (theropods and sauropodomorphs). Ornithischians. The great extinction of the Cretaceous-Tertiary boundary.

Unit 8. Birds. Origin and adaptation to the aerial environment. Large flightless carnivorous birds.

Unit 9. Mammals. Origin and Mesozoic mammals. Cenozoic radiation.

Unit 9. Primates. Origin. Non-hominoid primates.

Unit 10. Paleohistology applied to Vertebrate fossils.

Unit 11. Fossil vertebrates of the Iberian Peninsula. Main deposits in the Valencian Community. Heritage problems.

2. Practical Block

Practical 1. Taphonomy laboratory practices (Biostratinomic Phase): study of the remains of vertebrates obtained in the field trip.

Practical 3. Field work.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	15,00
Seminar	2,00
Other activities	7,00

Laboratory	6,00
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 methodology to be used will be based on the following elements:

• 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

- 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.

- 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.