

**Advanced Zoology**

Code: 100837  
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	OB	2	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

**Contact**

Name: Francesc Muñoz Muñoz  
Email: Francesc.MunozM@uab.cat

**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: No  
Some groups entirely in Spanish: No

**Other comments on languages**

Some teaching materials (dissemination articles, scientific articles, videos, etc.) may be in English or Spanish

**Teachers**

Guillermo Peguero Gutierrez

**Prerequisites**

There are no specific official prerequisites to course this subject.

**Objectives and Contextualisation**

The general objective of this subject is that students acquire theoretical and practical knowledge that gives a vision as most complete as possible of the diversity of arthropods and chordates from a morphological, functional and systematic perspective.

The specific aims are:

- To know the basic structural pattern of arthropods and chordates, and their main Subphyla.
- To know the differential and defining features of the main groups of arthropods and chordates, as well as the modifications of the different systems in the main groups of chordates (especially vertebrates) and arthropods (especially insects).
- To know the possible functional, and therefore adaptive, basis of the differential features of the main groups of arthropods and chordates.
- To obtain an overview of the phylogenetic relationships of the main groups of arthropods and chordates that allow us to understand the current diversity of these groups in an evolutionary context.

## Competences

- Communicate efficiently, orally and in writing.
- Develop a sensibility towards environmental issues.
- Identify organisms and recognise the different levels of biological organisation.
- Obtain, observe, handle, cultivate and conserve specimens.
- Recognise and analyse phylogenetic relations.
- Recognise and interpret the development, growth and biological cycles of the principal groups of living beings.

## Learning Outcomes

1. Collect and identify animal organisms.
2. Communicate efficiently, orally and in writing.
3. Develop a sensibility towards environmental issues.
4. Interpret the evolutionary processes that have led to animal diversity.
5. Recognise and interpret the different phases in the biological cycles of all animal groups.
6. Recognise and interpret the different states of development of the principal animal groups.

## Content

### ARTHROPODS

Unit 1.- What is an Arthropod? Definition of Arthropod. Positional characters. Traits of Arthropodization. Presentation of the large groups. Position of the Arthropods in the animal world.

Unit 2.- The cuticle and the moult. The layers of the integumentary system. Structure of the cuticle. Cuticle formations and coloration. Cuticle functions. Moulting or ecdysis.

Unit 3.- Metamerism, tagmatization and appendices. Generalized structure of a metamere. Basic terminology. Tagmatization: body regions. Cephalization. Basic organization of an appendix. Types and functions of the appendices.

Unit 4.- Internal organization. The central nervous system: brain and central nervous chain. The sympathetic nervous system. Neuroendocrine system and endocrine organs. Sensory organs. Digestive system. Excretory and respiratory systems. The coelom and the circulatory system. The reproductive system.

Unit 5.- Reproduction and development. Gonochorism. Parthenogenesis. Embryonic development. Post-embryonic development. Type of post-embryonic development. Type of larvae Metamorphosis.

Unit 6.- General classification. General arrangement of Arthropods. Some evolutionary hypotheses. Chelicerates. Basic characters of Chelicerates. Main groups: Scorpions, Spiders, Opiliones and Mites.

Unit 7.- Crustaceans. Basic characters of Crustaceans. Main groups: Branchiopods, Ostracods, Copepods, Hoplocarids, Peracarid Malacostracans and Eucarid Malacostracans.

Unit 8.- Myriapods. Main groups of Myriapods: Diplopods and Chilopods.

Unit 9.- Hexapods. Peculiarities of the Hexapods. General external morphology of Hexapods. Main groups of Hexapods. Main lines of diversification. Main groups: Collembolans, Odonatans, Orthopterans, Isopterans, Blattodeans, Lepidopterans, Dipterans, Coleopterans, Hymenopterans, Thysanopterans and Hemipterans.

### CHORDATES

Unit 10.- Chordates. Position of the Chordates within the animal world, abundance and diversity. Basic characters and general organization.

Unit 11.- The concept of "Prochordate". Urochordates. Diagnostic characters. General organization of ascidians. Diversity of Urochordates. Representative biological cycles.

Unit 12.- Cephalochordates. Diagnostic characters. General organization and development.

Unit 13.-Vertebrates. Definition. Interpretation of its structure in an evolutionary framework. General diversity. General considerations about its classification.

Unit 14.- "Agnathans": the Vertebrates without jaws. Myxiniiformes. Petromyzontiformes. Gnathostomes: the conquest of the aquatic environment. Acquisition of jaws and paired fins. Adaptations to life in the water. Chondrichthyes: diagnostic characters and diversity. The evolutionary success of the Osteichthyes. Actinopterygii: diagnostic characters and diversity.

Unit 15.- The conquest of the terrestrial environment. Sarcopterigii: diagnostic characters and diversity. The dipnoans and the coelacanth. Tetrapods: origin, diagnostic characters and adaptations to the terrestrial environment. Amphibians: diagnostic characters and diversity. Lissamphibia: Anura, Urodela and Gymnophiona.

Unit 16.- The expansion of terrestrial vertebrates. Evolutionary criteria for the diagnosis of large groups of Amniotes. The first Amniotes. The concept of "Reptile". Anapsida: Chelonia. Diagnosis characters and diversity of the diapsids. Lepidosauria: Sphenodontia and Squamata.

Unit 17.- Archosaurs: diagnostic characters and diversity. Crocodiles. Dinosaurs. Birds: origin and fundamental characteristics. Feathers. *Archeopteryx* and the Cretaceous Birds. Diversity of modern Birds.

Unit 18.- Synapsids. Origin and diagnostic characters of Mammals. Monotremes: oviparous mammals. Therians: diagnostic characters. The placenta. Marsupials: diagnostic characters and diversity. Eutherians: diagnostic characters. The adaptive radiation of the Eutherians.

## PROGRAM OF PRACTICES

### FIELD PRACTICE

Practice 1.- Advanced techniques for sampling arthropods.

### LABORATORY PRACTICES

Practice 1.- External organization of Chelicerates and Crustaceans. Recognition of differential morphological characters on specimens of the main groups. Dissection of a Mantis Shrimp.

Practice 2.- External organization of Myriapods and Hexapods. Recognition of differential morphological characters on specimens of the main groups. Dissection of a cricket.

Practice 3.- Diversity of Pancrustaceans (Hexapods and Crustaceans). Recognition of differential morphological characters on specimens of the main groups.

Practice 4.- Observation and interpretation of the anatomy of Cephalochordates and Urochordates. General characteristics of Vertebrates: dissection of a trout. External anatomy and diversity of Chondrichthyans and Osteichthyans.

Practice 5.- External anatomy and diversity of Amphibians (Urodeles and Anurans), and Squamates ("Saurians" and Ophidians).

Practice 6.- Anatomy of Birds and Mammals.

\*Unless the requirements enforced by the health authorities demand a prioritization or reduction of these contents.

## Methodology

The methodology used in this subject to achieve the learning process is based on students working on the provided information. The function of the teacher is to give them the information or to indicate where they can get it and to help and tutor them so that the learning process can be carried out effectively. To achieve this goal, the subject is based on the following activities:

#### Lectures:

With these classes the students acquire the basic scientific-technical knowledge of the subject, which must be complemented with the personal study.

#### Classroom practices:

In the classroom practices, students work on the scientific-technical knowledge presented in the master classes to complete their understanding and deepen in it, by developing various activities such as the analysis and discussion of videos on zoological topics, the resolution of issues related to the topics covered, analysis of zoological information, etc. The mission of the seminars is to promote the capacity for analysis and synthesis, critical reasoning and the ability to solve problems.

#### Field and laboratory practices:

During the practical sessions, the students work with the zoological material in the laboratory (observation of preparations and specimens, study of anatomy and morphology of groups, dissections, identifications of specimens, etc.) and in the field (terrestrial sampling techniques), complementing their study by means of information and questions posed in the practice script. The objective of the practical classes is to complete and reinforce the zoological knowledge acquired in the theoretical classes. In the practical sessions students are stimulated and they develop empirical skills such as the ability to observe, analyze and recognize the zoological diversity. At the same time, students are made aware of environmental issues.

#### Tutorships

In a complementary way, the students will have additional hours of teacher attention, in order to answer questions, clarify basic concepts and guide them about the documentary sources that have been recommended. The schedule of individualized tutorships will be specified with the teachers through the virtual campus.

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Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom practices	6	0.24	2, 4, 3
Field practices	5	0.2	6, 5, 1, 3
Laboratory practices	12	0.48	2, 6, 5, 1, 3
Lectures	27	1.08	4, 6, 5, 3
Type: Supervised			
Tutorships	6	0.24	2, 4, 6, 5, 3
Type: Autonomous			

Analysis and study of bibliographic materials	60	2.4	4, 6, 5, 3
Problem solving and preparation of works	25	1	2, 4, 3

## Assessment

This subject has a continuous evaluation process throughout the course that includes more than three evaluation activities of different types. None of them represents more than 50% of the final grade.

### 1.- Theory:

- Partial exams: In this exams, the knowledge acquired by the students during the course is evaluated individually, as well as their capacity for analysis and synthesis, and critical reasoning. The exam has part of test questions and other of conceptual questions, schemes, etc. There will be 2 partial exams, one corresponding to the part of Arthropods and the other to that of Chordates, each with a weight of 30% of the overall mark.
- Final exam: Students who do not pass one of the two partial exams (minimum mark: 5 out of 10), can re-assess the part or parts not passed in the final exam. Likewise, students who wish to improve their grade in one or both parts may do so by taking the final exam. However, taking the final exam implies renouncing the grade previously obtained. The mark corresponding to each of the two exams has a weight of 30% of the final mark. In order to be able to average with the other evaluative activities (seminars and practices) the average mark of the two exams must be equal or greater than 4.

### 2.- Classroom practices:

Both the work to be presented on the classroom practices days and the activities (in group and individual) that take place throughout the practice are evaluated. This activity has no possibility of recovery. The grade for the seminars has an overall weight of 20% of the final grade.

3.- Practices: Attendance to practices is mandatory. After each laboratory practice the students will take an individualized test that assesses the use and achievement of the specific skills of each practice. Each of the parts (Arthropods and Chordates) will have a value of 10% in the final grade. Therefore the overall weight of the practices will be 20% in the final grade. This activity has no possibility of re-assessment

### Final considerations:

The minimum overall grade required to pass the course is 5 out of 10.

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Valuable" if the weighthin of all conducted evaluation activities is less than 67% of the final score.

Students who can not attend an individual assessment test for justified reasons and provide the corresponding official documentation, will be allowed to take the assessment activity on another date.

\*Student's assessment may experience some modifications depending on the restrictions to face-to-face activities enforced by health authorities.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Classroom practices	20%	3	0.12	2, 4, 6, 5, 3
Partial exam I (final I)	30%	2	0.08	2, 4, 6, 5, 3

Partial exam II (final II)	30%	2	0.08	2, 4, 6, 5, 3
Practices	20%	2	0.08	2, 4, 1, 3

## Bibliography

### ARTHROPODS

- Armengol J. et al. 1986. Història Natural dels Països Catalans. Enciclopèdia Catalana. Vol. 9.
- Barrientos J.A. 2004. Curso Práctico de Entomología. Servei de Publicacions de la UAB.
- Blas M. et al. 1986. Història Natural dels Països Catalans. Enciclopèdia Catalana. Vol. 10.
- Krantz G.W. and Walter D.E. 2009. A manual of Acarology. Texas Tech University Press. 3rd ed.
- Grimaldi D. and Engel M.S. 2005. Evolution of the Insects. Cambridge University Press. 1st ed. (accessible on-line i descarregable en pdf des del web de la Biblioteca de la UAB)
- Gullan P.J. and Cranston P.S. 2010. The Insects: an outline of entomology. Blackwell. 4th ed.
- Hickman C.P. et al. 2017. Integrated principles of zoology. McGraw-Hill. 17th ed.
- Foelix R.F. 2011. Biology of Spiders. Oxford University Press. 3rd ed.

### CHORDATES

- De Iuliis G. and Pulerà D. 2019. The dissection of Vertebrates. Elsevier/Academic Press. 3rd ed. (accessible on-line i descarregable en pdf des del web de la Biblioteca de la UAB)
- Hildebrand M. et al. 2001. Analysis of Vertebrate structure. Wiley. 5th ed.
- Kardong K.V. 2018. Vertebrates: comparative anatomy, function, evolution. McGraw-Hill Education. 8th ed.
- Kent G.C. and Carr R.K. 2001. Comparative anatomy of the Vertebrates. McGraw Hill. 9th ed.
- Pough F.H. 2019. Vertebrate life. Oxford University Press. 10th ed.
- Weichert C.K. y Presch W. 1981. Elementos de anatomía de Cordados. McGraw-Hill. 2a ed.

### Web pages of interest

- Adena/World Wildlife Found: <http://www.wwf.es/>
- Animal Diversity Web: <http://animaldiversity.ummz.umich.edu/>
- ARKive, Images of life on Earth: <http://www.arkive.org>
- Biodidac: <http://biodidac.bio.uottawa.ca>
- California Academy of Sciences: <http://www.calacademy.org>
- Comissió Internacional de Nomenclatura Zoològica: <http://www.iczn.org/>
- Enciclopedia Virtual de los Vertebrados Ibéricos: <http://www.vertebradosibericos.org/>
- FishBase: <http://www.fishbase.org>
- Ibero Diversidad Entomológica Accesible: <http://sea-entomologia.org/IDE@/>
- Museu Nacional de Ciències Naturals de Madrid (CSIC): <http://www.mncn.csic.es/>

- Natural History Museum, Londres: <http://www.nhm.ac.uk/>
- The Ant Wiki: [https://www.antwiki.org/wiki/Welcome\\_to\\_AntWiki](https://www.antwiki.org/wiki/Welcome_to_AntWiki)
- The Bug Guide: <https://bugguide.net/node/view/15740>
- Zoología de los artrópodos (wikiversidad):  
[https://es.wikiversity.org/wiki/Zoolog%C3%ADa\\_de\\_los\\_artr%C3%B3podos](https://es.wikiversity.org/wiki/Zoolog%C3%ADa_de_los_artr%C3%B3podos)

## **Software**

No specific software is used in this subject.