Biology and Diversity in Arthropods

Code: 100849
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500251 Environmental Biology	OT	4

Contact

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Before enrolling to Biology and Diversity of Arthropods is convenient to have passed Mathematics, Biostatistics, Environmental Prospection, Ecology, Zoology and Zoology Extension. Besides, it is highly recommended to catch up with the contents of Zoology and the diagnostic traits of the main groups of arthropods studied in Extension of Zoology.

Objectives and Contextualisation

The objective of this course is to provide the background, tools and skills to:

(1) understand the evolutionary success and the ecological importance of the most diverse group of multicellular organisms from a morphological, functional, systematic and phylogenetic perspective;

(2) analyze its diversity in real communities and obtain a basic knowledge of their ecology and evolution.

Competences

- Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
- Identify and interpret the diversity of species in the environment.
- Identify organisms and recognise the different levels of biological organisation.
- Integrate knowledge of different organisational levels of organisms in their functioning.
- Obtain, observe, handle, cultivate and conserve specimens.
- Recognise and analyse phylogenetic relations.
- Take account of social, economic and environmental impacts when operating within one's own area of knowledge.
- Take sex- or gender-based inequalities into consideration when operating within one's own area of knowledge.

Learning Outcomes

1. Act with ethical responsibility and respect for fundamental rights and duties, diversity and democratic values.
2. Actuar en l'àmbit de coneixement propi avaluant les desigualtats per raó de sexe/gènere.
3. Collect, determine and conserve specimens and collections of invertebrates and vertebrates.
4. Interpret and recognise the different states of development of invertebrates and vertebrates.
5. Interpret the distribution and the interactions in the environment of invertebrates and vertebrates and their impact on biological diversity.
6. Interpret the evolutionary processes that have led to the diversity of invertebrates and vertebrates.
7. Interpret the origin and functioning of organic structures in the different groups of invertebrates and vertebrates.
8. Recognise the characteristics that distinguish the principal groups of invertebrates and vertebrates.
9. Take account of social, economic and environmental impacts when operating within one's own area of knowledge.

Content

Theory
What is an arthropod? Systematics and phylogeny of the group.
Arthropodization: detailed study of morphological and physiological adaptations such as ecdysis, internal anatomy, gas exchange and osmoregulation. Evolution of the nervous system in the different lineages of arthropods.
Diversity, ecology and evolution of major groups of arthropods (Chelicerata, Myriapoda, "Crustacea" and Hexapoda.
Evolution of flight and metamorphosis in insects.
Coevolution insect-plant.
Applied entomology.
Emotions in insects.
Evolution of sociality in insects.
Conservation of arthropods.

Seminars
In the seminars we will explore themes that are complementary to the theoretical classes in biology and diversity of arthropods. In addition, we will discuss relevant general scientific themes.

Practicals
Field practices: Learning sampling design and techniques for the study of arthropod diversity in real communities.
Lab practices: Detailed morphological study of the main arthropod groups. Manipulation and classification of real communities of arthropods.
Bioinformatic practices: A series of hands-on classes during which we will apply the background knowledge acquired in class and in the field to analyze real data.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Bioinformatic practices	3	0.12	3, 5, 6, 7
Fieldwork practices	8	0.32	3, 4, 5, 8
Laboratory practical classes	17	0.68	3, 4, 8

Lectures	22	0.88	4, 5, 6, 7, 8
Seminars	4	0.16	4, 5, 7, 8
Type: Supervised			
Tutorials	4	0.16	4, 6, 7, 8
Type: Autonomous			
Study and solve problems	50	2	4, 5, 6, 7, 8
Written reports, answer to questions	33	1.32	4, 5, 6, 7, 8

Lectures
Theory lectures will offer the necessary background to the student about the taxonomy, systematics, ecology and evolution of the main groups of arthropods. The students are expected to complement this session by studying both the proposed material and additional resources.

Seminars
During the seminar we will discuss not only current relevant themes in arthropod research but also sciences in general, in particular the role of women in science. The goal of this session is that students understand the state-of-the-art of research by reading and critically assessing research papers in the field.

Laboratory practices
The students will perform a detailed morphological study of the main groups of arthropods during the laboratory. During the laboratory practices the students will be able to work on the material collected during the field sampling whereby allowing them to learn how to prepare and identify specimens for a scientific collection. During the field and laboratory sessions we will strive to build a comprehensive dataset of the arthropod biodiversity of the University Campus. We will combine classical and modern methodology to sample, identity, and share our findings publicly via open access web applications. If there is sufficient interest from the students we can have one group of practicals taught in English.

Field practices
The aim of the field practices is to teach students basic field sampling methodology as well as to perform a longitudinal study of the arthropod diversity of the University campus.

Bioinformatic practice
At the informatics practical we will analyze the data collected during the field sampling with special emphasis on species distribution patterns. The main goal of this practical is that students learn to analyze the data collected in the field and draw conclusions based on the species distributionand ecology.

Mentorship
In this session the students will have the opportunity to ask questions related to the course either in private or in groups. This session can also be used to design and follow up the arthropod collection as well as the theoretical studies.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of report	20%	2.25	0.09	1, 2, 3, 4, 5, 6, 7, 8, 9
Evaluation of the arthropod collection	20%	2.25	0.09	1, 3, 4, 5, 6, 7, 8, 9
Partial exam I (final exam I)	25%	2	0.08	1, 2, 4, 5, 6, 7, 8, 9
Partial exam II (final exam II)	25%	2	0.08	1, 2, 4, 5, 6, 7, 8, 9
Seminars evaluation	10%	0.5	0.02	1, 2, 3, 5, 6, 8, 9

This course has a continuous grading process that includes five main grading activities of different typologies, distributed during the whole course with none of them representing more than 50% of the final student's score.

A. Theoretical classes (lectures)
Partial exams: Regular class contents will be assessed by means of two partial exams comprising about half of the theory program.
Final exam: Those students not reaching the minimum score (that is a 3 out of 10) in one or both partial exams will be able to have a second chance in a final exam of the same nature. Likewise, those students aiming to improve their scores in one or the two theory parts will be allowed to attend be examined of the corresponding part. However, in doing so the student will automatically lose their previous partial scores.
Each of the two theoretical partial exams will represent a 25% of the final global score.

B. Practices
The attendance to all laboratory, field, and bioinformatic sessions is mandatory. Students will be graded as "Not Evaluable" when the absence exceeds 20% of the scheduled sessions.
The practices will be graded through the observation of the attitude and participation of the students, the proper execution of the exercises and the reaching of the goals determined during the development of the sessions. Additionally, lab practices will be assessed by mean of a series of morphological studies that will be delivered at the end of each session. It is not possible to retake the practical sessions.

C. Arthropod collection
The students will make an arthropod collection in groups of 3-4 to be delivered at the end of the course. It will be possible to use the samples collected during the two field practicals. This session will have a weight of a 20% over the global score.

D. Report
At the end of the course the students will deliver a detailed report about an arthropod group of their choosing in terms of a Wikipedia page. The objective of this session is not only that students learn how to write a detailed report but also to produce quality content that can be publicly assessed about the taxonomy, systematics, ecology and evolution of arthropods. This session counts towards 20% of the final score.

E. Seminars
Presence in the seminars is mandatory and will be assessed through exercises covering the theme of the seminar. Students will be graded as "Not Evaluable" when the absence exceeds 20% of the scheduled sessions. This session counts towards 10% of the final score.

There is constant evaluation during this course, and during the theoretical classes I will ask questions in the form of online quizzes that may increase the final grade with a maximum of one extra point.

To participate in the final exam, students must have been previously evaluated in a set of activities, the weight of which is equivalent to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the grade "Not Assessable" when the evaluation activities carried out have a weighting of less than 67% in the final grade.

Bibliography

Brusca, R., et al. (2016). *Invertebrates* (3rd edn), Sinauer Associates Inc., Publishers, Sunderland.

Chapman, R., et al. (2013). *The insects: structure and function*, Cambridge University Press, New York.

Engel, M. S., and D. Grimaldi (2005). *The Evolution of Insects*, Cambridge University Press.

Fortey, R. A., and R. H. Thomas (1997). *Arthropod relationships*, Springer Science & Business Media.

Gullan, P. J., and P. S. Cranston (2014). *The insects: an outline of entomology*, John Wiley & Sons.

Harrison, J. F., et al. (2012). *Ecological and environmental physiology of insects*, OUP Oxford.

Koenemann, S., and R. Jenner (2005). *Crustacea and arthropod relationships*, CRC Press.

Minelli, A., et al. (2016). *Arthropod biology and evolution*, Springer.

Romoser, W. S. (2000). *Introduction to arthropods: structure, function and development*. In *Medical Entomology*, Springer: 13-51.

Snodgrass, R. E. (1952). *Textbook of arthropod anatomy*, Cornell University Press.

Stamou, G. P. (2012). *Arthropods of Mediterranean-type ecosystems*, Springer Science & Business Media.

Recursos electrónicos:

Comisión Internacional de Nomenclatura Zoológica: http://www.iczn.org/

Ibero Diversidad Entomológica Accesible: http://sea-entomologia.org/IDE@/

Museo Nacional de Ciencias Naturales 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

The Bug Guide: https://bugguide.net/node/view/15740

Wikiversidad zoo artrópodos: https://es.wikiversity.org/wiki/Zoolog%C3%ADa_de_los_artr%C3%B3podos

Software

The free software R will be used during the bioinformatics practices of this subject.

Language list

Name	Group	Language	Semester	Turn
(PCAM) Field practices	241	Catalan/Spanish	second semester	morning-mixed
(PCAM) Field practices	242	Catalan/Spanish	second semester	morning-mixed
(PCAM) Field practices	243	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	241	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	242	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	243	Catalan/Spanish	second semester	afternoon
(SEM) Seminars	241	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	24	Catalan/Spanish	second semester	morning-mixed