

**Parasitology**

Code: 100833  
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	OT	4	0

**Contact**

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**Use of languages**

Principal working language: spanish (spa)  
Some groups entirely in English: No  
Some groups entirely in Catalan: No  
Some groups entirely in Spanish: Yes

**Prerequisites**

There is no official prerequisite, but it is recommended for students to review the general concepts of Zoology, Zoology Extension, Ecology and Cell Biology and Histology studied in previous courses.

**Objectives and Contextualisation**

Throughout this course, the student must acquire the theoretical and practical knowledge that will allow him to know the parasitic species, which belong to the different animal groups, as well as, their different biological cycles. However, it must also understand the importance of parasites in the biodiversity of species and the complexity they contribute to the ecological level. The student must understand the effect that parasites have on the health of their hosts and on the functioning of ecosystems and their role in modeling the ecology of their hosts, from different points of view: populations as well as trophic networks. Finally, they will be aware of the usefulness of parasites as biomarkers in population and biological studies of their hosts and environment.

**Skills**

- Adopt an ethical stance.
- Develop a sensibility towards environmental issues.
- Develop planning and organisation skills.
- Focus on quality.
- Obtain, observe, handle, cultivate and conserve specimens.
- Perform biological diagnoses.
- Recognise and interpret the development, growth and biological cycles of the principal groups of living beings.
- Sample, characterise and manipulate populations and communities.

**Learning outcomes**

1. Adopt an ethical stance.
2. Collect and identify animal organisms.
3. Design and execute samplings of animal populations and communities in their habitats.
4. Develop a sensibility towards environmental issues.
5. Develop planning and organisation skills.

6. Focus on quality.
7. Identify and treat the principal diseases caused by fungi: their symptoms and the corresponding biological cycles.
8. Recognise and interpret the different phases in the biological cycles of all animal groups.

## **Content**

The general contents are the following:

### **I. GENERAL CONCEPTS**

1. Parasitism. Basic concepts in parasitology. Categories of parasitism. Inlet, contact and penetration pathways of the parasites. Parasitic pathways.
2. Life cycles of parasites. Types of guests and parasites. Adaptations to parasitism.

### **II. DIVERSITY OF PARATED GROUPS**

3. Protists: Excavata (Diplomonadids, Parabasalids, Quinetoplastids), Chromalveolata (Apicomplexes, Ciliates), Amoebozoans, Opisthokonta (Microsporidians). Mixozoans. Generalities, diversity, life cycles, pathogenesis and ecological role.
4. Plathelminths: Trematodes, Monogeneans, Cestodes. Acanthocephala. Generalities, diversity, life cycles, pathogenesis and ecological role.
5. Nematodes. Parasitic Arthropods: Crustaceans, Arachnids, Insects. Pentastomids. Generalities, diversity, life cycles, pathogenesis and parasitology.
6. Other groups with parasitic species: piglets, cnidarians, mesozoans, nematomorphs, rotifers, hirudineans, equiurids, molluscs and cordados annelids. Generalities, diversity, life cycles, pathogenesis and ecological role.

### **III. ADAPTATIONS AND EVOLUTION OF PARASITISM**

7. Origin and evolution of parasitic life: gradual adaptation to parasitism. Direct origin of parasitism. Origin of ectoparasitism and endoparasitism. Microhabitat of parasites. Origin of life cycles. Evolutionary and ecological consequences of complex life cycles. Origin of intermediate guests. Chains and trophic networks.
8. Specificity. Origin and degrees of parasitic specificity. Determinants and patterns of specificity. Parasitic evolution - host: macro-volatile and micro-metabolic patterns.
9. Parasitic balance - host. Host exploitation strategies. Guest strategies for parasites. Evasion of the immune response. Virulence

### **IV. PARASITARY ECOLOGY AND BIOGEOGRAPHY**

10. Introduction to parasitic ecology. Hierarchical nature of populations and communities of parasites.
11. Parasitic populations. Density-dependent regulatory factors and independent factors of density. Intraspecific interactions
12. Effect of parasites on host populations. Regulation of guest populations. Epidemiological implications. Behavioral changes. Hitchhiking.
13. Parasitic communities. Types of parasites in communities. Interspecific relationships and their effect on niche selection.
14. Parasitic biogeography. Factors related to the geographical distribution of parasites.

### **V. SANITARY ASPECTS AND UTILITY OF PARASITES FOR THE HUMAN BEING**

15. Main zoonoses. Interest and classification. Foodborne zoonoses and transmitted by water, the problem of the use of wastewater. Environmental and food health measures. Emergencies and / or re-emergencies due to environmental changes.

16. Principal parasitism. The problems of agricultural and livestock production, invasive species and protected areas.

17. Parasites as indicators of the biology of their hosts, of ecological stocks and of environmental deterioration.

## **Methodology**

The methodology used in this subject to achieve the learning process is based on making the student work and develop the information that the professor puts at his fingertips. Thus, the function of the teacher is to give the student the information, or indicate where he can achieve it, and help him and tutor it so that the learning process can be carried out effectively. To achieve this goal, the subject is based on the following activities:

### Lectures:

The content of the theory program will be taught by the teacher in the form of master classes. The theoretical classes can be complemented by the visualization of animations and videos related to the subjects treated in class and / or with activities of evaluation of the learning of the student, by means of the resolution of questions posed by the professor. The visual aids used in class by the teacher will be available on the Virtual Campus. With these expositive classes the student acquires the basic scientific-technical knowledge of the subject that must complement with the personal study of the explained subjects. It is recommended that students regularly consult the books recommended in the Bibliography section in order to consolidate and clarify, if necessary, the contents explained in class.

### Seminars:

The seminars work on the scientific-technical knowledge exposed to the theory classes to complete their understanding and deepen them, developing various activities such as the analysis and discussion of audiovisual material or scientific articles, the resolution of questions related to the treated subjects, analysis of parasitological information, talks of professionals, etc. The seminars are characterized by the active work of the student and his mission is to promote the capacity for analysis and synthesis, critical reasoning and the ability to solve problems. In addition, the students will have to choose between different taxonomic groups of interest in parasitology to carry out a work that they will have to present in the form of oral presentation during the hours of seminar.

### Laboratory classes:

The students perform the experimental work individually or in groups of 2 and under the supervision of the responsible professor. Before beginning each practice session, the student must have read the practice guideline in order to know the objectives of the practice, the basics and the procedures that he must perform and the protocol that he must develop. The objective of the practical classes is to complement and reinforce the knowledge acquired in theoretical classes and seminars. Practical sessions will be stimulated and developed in the student empirical skills such as the ability to observe, analyze and recognize parasitological diversity. At the beginning of each practical session there will be an introduction explaining the theoretical foundations of the practice to be performed. At the end of each practice the students will answer the questions posed by the teacher.

The laboratory practices consist of:

- 3 sessions of 3h to get acquainted with the identification of different taxonomic groups.
- 2 sessions of 4h destined to work the process of obtaining and preparing the parasitological material. In addition, calculations will also be made for the estimation of parasitological parameters necessary when it comes to quantitatively describing the level of infestation by a species of parasite that is the basis for any subsequent ecological study.
- 1 session of 3 h in the audiovisual room where the joint behavior of populations of parasites and hosts will be studied according to simple population models through computer simulations.

### Tutorials:

The purpose of these sessions is to resolve doubts, clarify basic concepts and guide the sources consulted by the students. Likewise, these tutorials allow the orientation of the work that the students will do for the seminars.

## Activities

Title	Hours	ECTS	Learning outcomes
<b>Type: Directed</b>			
Laboratory classes	20	0.8	1, 5, 3, 6, 7, 8, 2, 4
Lectures	24	0.96	1, 7, 8, 4
Seminars	8	0.32	1, 5, 6, 7, 8, 4
<b>Type: Supervised</b>			
Tutorials	6	0.24	7, 8, 4
<b>Type: Autonomous</b>			
Preparation of works and resolution of questions	32	1.28	1, 5, 6, 7, 8, 4
Study and resolution of problems	51	2.04	1, 5, 6, 7, 8, 4

## Evaluation

The evaluation of this subject is carried out throughout the course, evaluating the different activities that are carried out:

### Evaluation of the exams:

Partial exams: In this part, students' knowledge of the subject will be assessed individually, as well as their capacity for analysis and synthesis, and of critical reasoning. There will be 2 eliminatory partial examinations of matter (material with a minimum grade of 5 out of 10 will be eliminated).

Retake process: Students who do not pass one of the two partial exams can recover them to the recovery exam. **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 Avaluable" if the weighthin of all conducted evaluation activities is less than 67% of the final score.** Likewise, students who wish to improve the grade of one or both of the parts can do also the retake, but in this case the previously obtained note will be lost.

The mark corresponding to the two exams has a global weight of 50% of the final mark.

### Evaluation of seminars:

Both oral works (content, capacity for synthesis, rigor in the expression, quality of documentary sources and timing) will be assessed as written, which should be presented on seminar days, as well as the tests of The evaluation will be developed throughout the seminar and the participation and assistance to all the seminars. In addition, the topics covered in the seminars, being a complement to the treaties in theory classes, may be subject to examination.

The note corresponding to the seminars has a global weight of 20% of the final mark.

### Evaluation of the Laboratory classes:

After each practice the student will perform an individual test that evaluates the use and achievement of the specific competencies of each practice. Likewise, the involvement of the students in the activities that will be carried out during the course of their own practice will also be valued. Attendance at practical sessions is mandatory. Students will obtain the "No Avaluable" qualification when the absence exceeds 20% of the scheduled sessions. "

The mark corresponding to the practices has a global weight of 30% of the final mark.

#### Final Considerations:

To pass the subject, a minimum grade of 4 is required in each of the different parts.

A student will be considered "No Avaluable" when the assessment activities carried out have a weighting of less than 67% in the final grade.

### Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Laboratory classes	30%	2.5	0.1	1, 5, 3, 6, 7, 8, 2, 4
Seminars	20%	2	0.08	1, 5, 6, 7, 8, 4
Theory	50%	4.5	0.18	5, 7, 8, 4

### Bibliography

#### References:

BUSH, A.O., FERNANDEZ, J.C., ESCH, G.W., SEED, J.R. (2001). *Parasitism. The Diversity and Ecology of Animal Parasites*. Cambridge University Press, Cambridge.

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ESCH G.W., FERNÁNDEZ J.C. (1993). *A functional biology of parasitism. Ecological and evolutionary implications*. Chapman & Hall, London.

GÁLLEGO-BERENGUER (2006). *Manual de Parasitología. Morfología y biología de los parásitos de interés sanitario*. Publicacions i edicions de la Universitat de Barcelona

POULIN, R. (2007). *Evolutionary ecology of parasites*. Princeton University Press, Princeton.

POULIN, R., MORAND S. (2004). *Parasite Biodiversity*. Smithsonian Books, Washington.

HALTON D.W., BEHNKE J.M., MARSHALL I. (EDS) (2001). *Practical exercises in parasitology*. Cambridge University Press.

ROBERTS, L.S., JANOVY, J. JR. (2000). *Foundations of Parasitology*, 6th Edition, Wm. C. Brown Publishers, Dubuque.

SULLIVAN J.T. (2000). *Electronic Atlas of Parasitology*. McGraw Hill.

#### Websites

<http://tolweb.org/tree>

<http://www.dpd.cdc.gov/dpdx/Default.htm>

<http://asp.unl.edu/index.php>