Universitat Autònoma de Barcelona

2023/2024

Ecology

Code: 106778
ECTS Credits: 6

Degree	Type	Year	Semester
2504604 Environmental Sciences	OB	2	1

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Carlos Hernandez Castellano

Prerequisites

There are no official prerequisites. However, being a subject with transversal content, it would be desirable to have passed most of the previous subjects.

Objectives and Contextualisation

The aim of this subject is to provide the basic knowledge of ecology for a graduate in environmental sciences. This biological discipline is fundamental to understanding the interaction between man and the environment, which, after all, is the key objective of Environmental Science studies. Although the focus is on basic science, the aim will be to show the usefulness of the ecological concepts being studied. The subject places special emphasis on the quantitative aspects of ecology, so that the student will find it necessary to use the mathematical and statistical tools studied in previous subjects of the degree.

Learning Outcomes

- KM50 (Knowledge) Identify and assess the biological function of organisms and the plant landscape in relation to an environmental problem.
- KM51 (Knowledge) Identify organisms and biological processes in their environmental context.
- KM52 (Knowledge) Identify the basic aspects that play a role in the dynamics and relationships between biological populations within natural system management.

- SM49 (Skill) Establish appropriate relationships between the flows of physical (energy, matter, etc.) and biological origin that take place in ecosystems.
- SM50 (Skill) Characterise specimens, populations and biological communities.
- SM51 (Skill) Safely use techniques and instruments for the analysis of biological samples in the field and/or laboratory.

Content

The syllabus is divided into four blocks. The first block is dedicated to the study of individual species (populations) and their dynamics. Its main applications are in the field of species conservation and management or exploitation. The second block already considers all the species together (community) and asks, basically, why in some places or times there are more than in others, and how the different species relate to each other. Its main applications are in the field of conservation. The third block also deals with communities but is interested in their interaction with the environment, in particular with regard to matter and energy exchanges: biomass production, water and nutrient circulation, to name a few examples. Its main applications are in the field of sustainable management of the environmental goods and services provided by ecosystems and in the study of global environmental change. The fourth block consists of field and computer exercises that will illustrate different aspects of the subject

Block 1. Population dynamics

1. Introduction. What is ecology? Ecology in the context of environmental sciences. The need for a quantitative approach. Man in nature. Are we close to ecological collapse?

2. How do populations grow? Basic demographic processes. Unlimited growth and density-regulated growth. Exploitation of populations.

3. We are not all the same: Structured populations. Exponential growth with age structure. Other structuring factors. Transition matrices.

4. Populations in space. Local populations and metapopulations. Local and regional extinction. Colonization. Models of metapopulations. Conservation of populations.

5. We are not alone: Interactions between species. Competition, predation and mutualism. Indirect effects.

Block 2. Ecological communities

6. The architecture of biodiversity. Diversity and biodiversity. Measurement of biodiversity. Ecological networks. Key species

7. The incessant change: Succession and disturbance. Models of succession. Disturbance regime. Hypothesis of the intermediate disturbance.

8. Communities in space: Biogeography. Communities and metacommunities. Species-area relationship. McArthur and Wilson's model.

9. Conservation of biodiversity. Extinctions in the past. The current great extinction. Invasive species and their effects. Reserves. Assisted migration. Rewilding.

Block 3. Functioning of ecological communities

10. What are ecosystems? Matter and energy. Characteristics and structure of terrestrial and aquatic ecosystems. Compartment and flux models.

11. What moves ecosystems? Energy flux. Primary production. New production and recycled production. Secondary production. Herbivores and detritivores.

12. What moves ecosystems? Matter fluxes. The hydrological cycle. Cycles of nutrients. Differences between aquatic and terrestrial ecosystems.

13. Global ecology. The main biogeochemical cycles in the Biosphere: C, N, P and S. Alterations: eutrophication, acid rain, global change. The Gaia hypothesis.

Block 4. Practices

Main issues that will be discussed:

- Production and biomass of a forest (field and computer practice)

- Lovelock's Daisyworld and the tipping points of the Biosphere (computer practice)

Methodology

The teaching methodology combines the following learning activities:

(a) lectures (whole group) in which the theoretical bases of ecology are presented. Covers blocks 1, 2 and 3 of the contents.

(b) classroom practices (in two groups) to (1) solve numerical problems that help to illustrate and consolidate the concepts seen in the theory classes (corresponding blocks 1 , 2 and 3 of the contents); and (2) present case studies or debates corresponding to different contents.

(c) computer labs (in four groups) in which two activities will be carried out: (1) solving complex numerical problems that require the use of a computer; and (2) the analysis and discussion of the data collected in the field practices (block 4 of the contents).

(d) field work (in four groups) to study the production and biomass of a Mediterranean forest. Corresponds to block 4 of the contents.

(e) tutorials aimed at resolving doubts and guiding students beyond the specific classroom practice sessions. The schedule of individual tutoring will be specified with the teachers through the virtual campus.

Most of the materials covered in blocks 1, 2 and 3 can be followed with the textbook *Ecología con números* available in electronic format at the DDD of the UAB (http://ddd.uab.cat/record/225887). The book is particularly suitable for solving numerical problems, which form the core of the subject. At the beginning of the course, it will be indicated which parts of the book are compulsory study, regardless of whether or not they are covered in face-to-face classes. The rest of the subject material will be available on the virtual campus.

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 numerical problems lab	12	0.48	
Computer lab	6	0.24	

Field work	6	0.24
Lectures	24	0.96
Type: Supervised		
Tutorials	4	0.16
Type: Autonomous		
Preparation and presentation of essays	31.5	1.26
Self study	62	2.48

Assessment

The evaluation of the subject includes:

- Partial exam corresponding to block 1 of the contents (individual; 1.5h duration): 20% of the grade

- Partial exam corresponding to blocks 2 and 3 of the content (individual; 3 hours long): 40% of the grade

- Evaluation of case studies in classroom practices: 10% of the grade

- Evaluation of computer lab: 10% of the grade

- Evaluation of field work: 20% of the grade

The final grade of the subject (F) is calculated as the weighted mean of the above grades. To pass the subject, F must be greater than or equal to 5; it is also necessary that the grade of the first partial is greater than or equal to 4 and that of the second partial be greater than or equal to 4 in both the part corresponding to block 2 and that of block 3.

Attendance at field practicals, computer practicals and group classroom discussions is compulsory. Non-attendance without a justified reason leads to a grade of 0 in the corresponding activity.

- Second-chance exam. In order to participate in the second-chance exam, students must have previously been assessed in a set of activities whose weight is equivalent to a minimum of two-thirds of the subject's total grade. If the grade for any of the partial exams in each block of the subject is lower than 4, there is the possibility of taking a second exam in January to recover one or more partials. Passed students (F > 5), if they wish, can also recover the partials to raise their grade. By taking this second-exam, the grade obtained previously is waived.

SINGLE ASSESSMENT Those who have opted for the single assessment method must take a final exam divided into three parts.

FIRST (30% of the final grade): A theory exam with essays, short and test-type questions. A minimum grade of 4 is required.

SECOND (30% of the final grade): A problem exam where you will have to solve a series of numerical exercises like those worked on in the classroom practice sessions. A minimum grade of 3 is required.

THIRD (20% of the final grade): A computer exam on the contents of the field practice (provided that you have attended the field trip; otherwise, the grade is zero).

The grade will be the weighted average of the three previous activities. The case studies discussed in the classroom practices and the computer lab are not part of the single assessment, so they will have had to be done like the rest of the students, in a group; this part corresponds to 20% of the final mark.

If the final grade does not reach 5, the student has another opportunity to pass the subject through the second exam that will be held on the date set by the degree coordinator. The case studies discussed in classroom practices and the computer lab are not recoverable.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of study cases in the classroom	10	0	0	KM50, KM52
Evaluation of the computer lab	10	0	0	KM52, SM49
Evaluation of the field work	20	0	0	KM51, SM50, SM51
First partial exam	20	1.5	0.06	KM52, SM50
Second partial exam	40	3	0.12	KM50, KM51, KM52, SM49, SM50

Bibliography

Literature

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Molles Jr. MC (2006) Ecología. Conceptos y aplicaciones (3ª ed). McGraw-Hill · Interamericana, Madrid.

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Ricklefs RE, Relyea R (2018) *Ecology: the economy of nature* (8th ed). Freeman, New York.

Rodríguez Martínez J (2010) *Ecología* (2ª Ed.). Piràmide, Madrid.

Townsend CR, Harper JL, Begon M (2014) *Essentials of Ecology* (4th ed). Blackwell Science, Oxford. (ebook)

Software

Simulation programs of the book *Ecología con Números.* Available at http://ddd.uab.cat/record/225887)