Universitat Autònoma de Barcelona

2021/2022

Ecology

Code: 102802
ECTS Credits: 9

Degree	Type	Year	Semester
2501915 Environmental Sciences	OB	3	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

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Use of Languages

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

Teachers

Carlos Hernández Castellano

Prerequisites

There are no official prerequisites. In any case, since it is a subject with transversal contents, it would be desirable that most of the subjects of previous courses had been passed.

Objectives and Contextualisation

The objective of this course is to provide the basic knowledge of ecology for a graduate in environmental sciences. The approach is of basic science, but the practical applications of the concepts discussed are also considered. There is a special emphasis on the quantitative aspects of ecology, so the student must use mathematical and statistical skills obtained in previous courses.

Competences

- Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
- Analyze and use information critically.
- Collect, analyze and represent data and observations, both qualitative and quantitative, using secure adequate classroom, field and laboratory techniques
- Demonstrate adequate knowledge and use the most relevant environmental tools and concepts of biology, geology, chemistry, physics and chemical engineering.
- Demonstrate concern for quality and praxis.
- Demonstrate initiative and adapt to new situations and problems.
- Learn and apply in practice the knowledge acquired and to solve problems.
- Quickly apply the knowledge and skills in the various fields involved in environmental issues, providing innovative proposals.
- Teaming developing personal values regarding social skills and teamwork.
- Work autonomously

Learning Outcomes

1. Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
2. Analyze and use information critically.
3. Demonstrate concern for quality and praxis.
4. Demonstrate initiative and adapt to new situations and problems.
5. Describe, analyze and evaluate the environment.
6. Diagnose and solve environmental problems concerning the biological environment.
7. Identify and interpret the diversity of organisms in the environment.
8. Identify organisms and biological processes in the surrounding environment and evaluate them properly and originally.
9. Learn and apply in practice the knowledge acquired and to solve problems.
10. Manage and conserve populations and ecosystems.
11. Observe, recognize, analyze, measure and properly and safely represent organisms and biological processes.
12. Participate in environmental assessments as to the biological environment.
13. Teaming developing personal values regarding social skills and teamwork.
14. Work autonomously

Content

The course is divided into four blocks. The first block is devoted to the study of individual species (populations) and their dynamics. Its main applications are in the field of conservation and management or exploitation of species. The second block considers all the species together (community) and asks, basically, why in some places or moments there are more species than in others, and how the species relate to each other. Its main applications are in the field of conservation. The third block also deals with communities, but here the interest is in their interaction with the physical environment, particularly in the exchange of matter and energy: biomass production, circulation of water and nutrients, ... Its main applications are in the field of sustainable management of environmental services provided by ecosystems and in the study of global environmental change. The fourth block consists of field practices that illustrate different aspects of ecology.

Block 1. Population dynamics

1. Introduction. What is ecology? Ecology within the environmental sciences. The importance of a quantitative approach. Humankind and nature. Are we close to the ecological collapse?

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

3. We are not all equal: 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. Metapopulation models. Conservation of populations.

5. We are not alone: inter-specific interactions. Competition, predation, and mutualism. Epidemiology. Diffuse interactions. Indirect effects.

Block 2. Community ecology

6. The architecture of biodiversity. Diversity and biodiversity. Measurement of biodiversity. eDNA. Mutualistic and trophic webs. Keystone species.

7. The endless change: succession and perturbation. Models of succession. Perturbation regime. Intermediate disturbance hypothesis.

8. Communities in the space: biogeography. Communities and metacommunities. Species-are relationship. The model of McArthur and Wilson. The Hubbell's model.

9. Conservation of biodiversity. Past important extinctions. The current great extinction. Invasive species. Natural reserves. Assisted migration. Rewilding.

Block 3. Function of ecological communities

10. What are ecosystems? Matter and energy. Characteristics and structure of terrestrial and aquatic ecosystems. Models of compartments and flows.

11. Energy flow. Primary production. New and recycled production. Secondary production. Herbivores and detritivores.

12. Nutrient cycling. The hydrologic cycle. Transport of the main biological elements: C, N, P, and S. Differences between aquatic and terrestrial systems.

13. Global ecology. The main biogeochemical cycles in the Terrestrial Biosphere. Alterations: eutrophication, acid rain, global change. The Gaia hypothesis.

Block 4. Fieldwork

- Forest biomass and production

- Interaction between plants and pollinators

Methodology

(a) Lectures (whole group, half group or online) will be used to present the theoretical bases of ecology (blocks 1, 2, and 3 of the contents).

(b) Classroom practices (in two groups) will be used to (1) solve numerical problems (blocks 1, 2, and 3 of the contents); (2) presentation and development of case studies, and (3) discussion related to fieldwork.

(c) Computer labs (in four groups) to (1) solve complex numerical problems that require a computer; and (2) Analysis of data collected in the two field trips (block 4 of the contents).

(d) Two field trips (in four groups): (1) Biomass and productivity of a Mediterranean forest; and (2) Interaction between plants and pollinators. (block 4 of the contents).

(e) Tutorials to solve doubts and general guidance beyond the scheduled activities.

Most of the material of blocks 1, 2, and 3 can be studied in the textbook *Ecologia con números,* available in its electronic form in the DDD of UAB (http://ddd.uab.cat/record/225887). In the first class, it will be indicated which parts of the book are compulsory. The rest of the material will be provided in the CV.

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	16	0.64	

Computer lab	8	0.32
Field work	16	0.64
Lectures	30	1.2
Type: Supervised		
Tutorials	4	0.16
Type: Autonomous		
Preparation and presentation of essays and short talks	54	2.16
Self study	92	3.68

Assessment

The assessment of the course comprises:

- First partial exam: block 1 and part of block 2 of the contents (individual; 2 hours; weight: 30%)

- Second partial exam: part of block 2 and block 3 of the contents (individual; 2 hours; weight: 30%)

- Study cases: weight 20%

- Fieldwork: weight 20%

The final grade (F) is calculated as the weighted mean of the grades indicated above. To pass the course F must be equal to or greater than 5. In addition, the two partial exams must have a grade equal to or greater than 4.

- Second opportunity. To deserve it, the student must have been evaluated of activities comprising at least two-thirds of the total. When the grade of one or two partial exams was lower than 4, there is a second opportunity exam for one or both partial exams. Students with F>5 can also attempt this second opportunity exam, but by doing so they renounce to the former grade.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evaluation of case studies	20%	0	0	2, 9, 4, 3, 6, 1, 13
Evaluation of field work	20%	1	0.04	3, 5, 6, 10, 8, 7, 11, 12
First partial exam	30%	2	0.08	2, 9, 6, 10, 1, 14
Second partial exam	30%	2	0.08	2, 9, 4, 3, 6, 12, 1, 14

Bibliography

Bibliografia

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Krebs CJ (2009) *Ecology. The experimental analysis of distribution and abundance (*6th ed). Harper Collins, New York.

Margalef R (1974) *Ecología* (2a ed). Omega, Barcelona.

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

Piñol J, Martínez-Vilalta J (2006) *Ecología con números. Problemas y ejercicios de simulación*. Lynx, Bellaterra (Barcelona). (ebook available at http://ddd.uab.cat/record/225887)

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