Universitat Autònoma de Barcelona

2019/2020

Ecology

Code: 100988
ECTS Credits: 6

Degree	Type	Year	Semester
2500502 Microbiology	FB	2	2

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

Prerequisites

Although there are no official prerequisites, it is advisable for the student to have completed the optional subjects

Objectives and Contextualisation

This is a second course subject that introduces the student to the most basic concepts, methods and applications of ecology. It also applies these principles to studies of specific cases with particular social relevance such as epidemiology, biological control or global change. It places special emphasis on the relationships between organisms with the physical environment, the structure and dynamics of populations and communities, and the transfer of matter and energy within communities and ecosystems.

In the same course, the student integrates these basic knowledge with a specific vision of the ecology of microorganisms to the compulsory subject of Microbial Ecology. The contents and competences of the subject of Ecology are also related to those taught in the compulsory subjects of Plant Biology and Animal Biology, and of Environmental Microbiology, as well as with the optative Edaphology and Applied Vegetable Physiology.

The main objective of the course is to provide basic training for the study of the structure and functioning of natural systems at various levels of organization:

1. Organisms: forming the student in the basic concepts related to autoecology, that is to say, the relation of living beings to the environment, providing the basic knowledge of the formalization of the environmental parameters for their ecological analysis.

2. Populations: forming the student in the concept of population and their meanings, and introducing it into techniques for assessing the abundance of organisms, and monitoring and modeling the dynamics of populations.

3. Communities: teaching the student to evaluate the structure of communities, the functional relationships between species (interspecific competition, depredation, symbiosis) and their community-level manifestations (trophic networks); and to analyze its dynamics in time (succession and disturbances).

4. Ecosystems: Introducing the student to the general characteristics of the environment that are relevant to

understanding the exchanges of matter and energy in the trophic networks, as a necessary step for the study of biogeochemical cycles.

Competences

- Communicate orally and in writing.
- Develop critical reasoning skills in the field of study and in relation to the social context.
- Display sensibility towards environmental, health and social matters.
- Identify and solve problems.
- Obtain, select and manage information.
- Recognise the different levels of organization of living beings, especially animals and plants, diversity and bases of regulation of vital functions of organisms and identify mechanisms of adaptation to the environment.
- Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.
- Work individually or in groups, in multidisciplinary teams and in an international context.

Learning Outcomes

1. Communicate orally and in writing.
2. Develop critical reasoning skills in the field of study and in relation to the social context.
3. Display sensibility towards environmental, health and social matters.
4. Identify and solve problems.
5. Interpret the complexity of the global dynamics of natural systems on their different scales of analysis
6. Obtain, select and manage information.
7. Understand how the different levels of biological organisation are integrated globally.
8. Use bibliography or internet tools, specific to microbiology or other related disciplines, both in English and in the first language.
9. Work individually or in groups, in multidisciplinary teams and in an international context.

Content

Part I. Organisms and populations

1. Ecology and evolution
Definitions and development of the science of ecology. Scientific method Theory of natural selection of Darwin and Wallace. Variability, natural selection and fitness. Adaptation: geographic and ecological perspective. Evolutionary bases of adaptation. Adaptive peaks Coevolution and speciation.

2. Response of organisms to environmental factors
Environment, habitat and distribution area. Conditions and resources. Type of response of organisms to the physical environment. Abiotic factors: the example of temperature. Factors that determine the distribution of species. Concept of ecological niche: fundamental niche and real niche.

3. Biological cycles and basic demographic parameters and processes
Ecological definition of population. Demography and population dynamics. Basic demographic processes: birth, mortality, emigration and immigration. Estimates of the population size. Definition of organism: unitary and modular organisms. Classes of biological cycles. Reproductive stress and frequency of reproduction.

4. Population dynamics models
Exponential growth model. Instant rate and finite rate of increase. Effects of density in organisms and load capacity. Logistic model of growth. The interpretation of r and K and ecological and evolutionary implications. Metapoblational models.

5. Structured populations by age
Age structure of a population. Age pyramids, deviation tables and survival curves. Dynamic and static tables of

life. Survival parameters, net reproduction rate, generation time. Projection of the population size: the matrix of Leslie.

6. Interactions between species
Ecological interactions Interspecific competition. Model of Lotka and Volterra for competition. Principle of competitive exclusion and character offset. Predation Ecological and evolutionary effects of predation. Model of Lotka and Volterra for depredation.

7. Ecological bases of epidemiology
Parasites and parasitoids. The guests as habitats. Evolution of the host-parasitic system. Dynamics of populations of parasites and hosts. Infection, basic reproductive rate and transmission threshold.
Micro-parasitic models with direct transmission and with vectors. Ecological effects of illness on the guests.
The host-parasitoid system. Nicholson and Bailey's hostile model between host-parasitoid.

Part II. Communities and ecosystems

8. Assembling communities
Definitions and approaches in the study of communities. Composition and structure of communities. The communities in space. Pool of spices, dispersion and types of barriers. Interspecific competence and character segregation. Neutral models in communities.

9. Dynamics of communities
The communities in time. Primary and secondary succession. Hypothesis of succession and climax. Patterns in succession: characteristics of the succession stages at the species level, iecosystem community. Markov chains applied to the study of succession.

10. Structure of communities: diversity
Concept of biodiversity. Genetic and molecular diversity. Definitions of wealth and diversity of species. Quantitative measures: Shannon-Wiener index, equity, dominance. Alpha, beta and diversity range. Models in the distribution of the abundance of the species. Networks of interactions between species. Gradients of diversity and hypothesis. Wealth in islands: model of the theory of insular biogeography. Extinction debt

11. Exchanges of matter and energy in ecosystems
Primary and secondary production in terrestrial and aquatic communities. Decomposition and circulation of nutrients in communities. Flow and balance models. Nutrient cycles.

12. Global change
Anthropogenic climate and landscape alterations. Effects on biogeochemical cycles, habitats and biodiversity.

Methodology

Theory class: The fundamental contents of the subject will be explained, emphasizing those of more difficult comprehension for the student. The basic material of the presentations made by the teacher will be provided. These classes are complementary to the student's activity based on reading and studying textbooks.

Problem classes: Numerical resolution of problems related to the contents of some topics. They may involve the complete resolution of problems in the classroom or the correction of problems previously proposed to students.

Classroom practices: they will be based on case studies of transversal themes and with social repercussion in which the fundamental concepts of the subject are applied. The material student will be provided on which a discussion process will be established in the classroom.

Pauted exercises: a series of exercises will be proposed, which can be numerical, reasoning, graphic representation, etc., to be solved individually or in groups. The student will be provided with the basic instructions and information necessary for their resolution, stimulating and valuing the student's creativity and ability to research at the same time. In case the exercises are evaluable, they must be delivered promptly within the established deadlines and must be edited properly.

Tutorials: The tutorials will be carried out at scheduled hours in the offices of the teachers of the subject (C5b-118, C5b-058). If the development of the subject, and particularly the exercises, requires it, a part of the tutorials can be done in the classroom in hours and location to be specified.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Class activities	6	0.24	7, 2, 6, 5, 1, 9, 3, 8
Problem solving classes	10	0.4	2, 4, 6, 5, 1, 9
Theory classes	29	1.16	7, 2, 4, 6, 5, 3
Type: Supervised			
Meetings	5	0.2	7, 2, 4, 5, 9, 3
Supervised exercises	34	1.36	7, 2, 4, 6, 5, 1, 9, 3, 8
Type: Autonomous			
Study	45	1.8	7, 2, 4, 6, 5, 9, 3, 8
Text reading	15	0.6	7, 2, 6, 5, 9, 3, 8

Assessment

- The evaluation of the subject is made from 2 notes:

(a) Theoretical note, which is obtained from the average of the notes of 2 partial exams corresponding to the two parts of the syllabus, and possibly of its recoveries. Ponder 70% of the final grade.

(b) Note of problems, that is obtained from the works commissioned during the semester or of evaluable activities carried out during the theoretical classes. Each activity may have a different weight in the note. It weights 30% of the final grade.

- If the theory note is greater than or equal to 4, the problem note is calculated to calculate the "total note", according to the relation: Theory 70%, Problems 30%. The subject is exceeded if you get a total score equal to or greater than 5.

- If the total grade is less than 5 or if the theory mark is less than 4, partial exams that are suspended can be recovered on the date set for the recovery exam (only the partial partial suspension). This test will not be used to upload the students' note that have a total grade> = 5, or have passed the two partial ones.

- To participate in the recovery, the students must have been previously evaluated in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject or module. Therefore, students will obtain the "Non-Valuable" qualification when the assessment activities carried out have a weighting of less than 67% in the final grade.

- The recovery test will be in the same style as the partial tests (described below)

- The note of problems is not recovered, so that if the total grade is less than 5, despite the approval of the deteoria note, the subject will be suspended.

- Exams may include three types of questions:

Test type questions
Short answer questions aimed at assessing whether the key conceptual objectives have been achieved.
Problems or exercises with numerical calculation, intended to evaluate the achievement of methodological objectives.
Questions that involve a complex answer with the development of a topic or the exposition of a hypothesis. It is wanted to assess if the student is able to explain and relate processes or complex concepts.

- The examinations have a special weight in the evaluation since it is the only activity of individual evaluation controlled by the teacher. Therefore, it is considered that the student must take a note of 4 or more in each one of the examinations (that is to say, the partial), to be able to calculate the average theory. Therefore, partial exams that do not reach 4 must be recovered.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exam	70%	6	0.24	7, 2, 4, 5, 1
Problems and exercices	30%	0	0	7, 2, 4, 6, 5, 1, 9, 3, 8

Bibliography

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Enllaços web

http://www.ecologiaconnumeros.uab.es/