

Course guide

2500200 - GECBIOLECO - Biology and Ecology

Last modified: 01/10/2023

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 745 - DEAB - Department of Agri-Food Engineering and Biotechnology.

Degree: BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: EMILIO JOSE GUALDA MANZANO

Others: EMILIO JOSE GUALDA MANZANO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

14445. Recognize the biological bases and foundations of the plant and animal field in engineering: notions of genetics, biochemistry and metabolism, physiology, organisms and environment, population dynamics, flows of matter and energy and changes in ecosystems, biodiversity, principles of the kinetics of microbial growth and reactor theory.

14446. Solve mathematical problems that may arise in engineering by applying knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, optimization, ordinary differential equations.

14447. Obtain basic knowledge about the use and programming of computers, operating systems, databases and basic numerical calculation and applied to engineering.

14448. Manage the basic concepts about the general laws of mechanics and thermodynamics, concept of field and heat transfer, and apply them to solve engineering problems.

14449. Apply the basic principles of general chemistry, organic and inorganic chemistry and their applications in engineering.

14450. Describe the global functioning of the planet: atmosphere, hydrosphere, lithosphere, biosphere, anthroposphere, biogeochemical cycles (C, N, P, S), soil morphology and apply it to problems related to geology, geotechnics, edaphology and climatology.

General:

14440. Identify, formulate and solve problems related to environmental engineering.

14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.

TEACHING METHODOLOGY

The course consists of 4 hours per week of classroom activity (large size group).

Three hours are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The following hour is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of hours devoted to laboratory practices.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.



LEARNING OBJECTIVES OF THE SUBJECT

The objective of this subject is the acquisition by the student of the notions of zoology and botany necessary in the field of Environmental Engineering. For this, the large groups of organisms that make up ecosystems, their differential characteristics and the fundamental aspects of their biology and metabolism, as well as their distribution and relationship with the environment are studied. Related aspects such as population dynamics, matter and energy flows and changes in ecosystems and biodiversity will be worked on. The aim is for the student to be able to assess the role of organisms in the landscape and also be able to assess the ecosystem services derived from certain activities

1. Understand the essential aspects of the morphology, phylogeny and systematics of living organisms and the general characteristics of fungi, algae and plants and foundations of zoology knowing the most general characteristics of the animal kingdom.
2. Know the metabolic routes (anabolic and catabolic) that allow the assimilation of nutrients, as well as essential aspects of regulation metabolic.
3. Know the main processes involved in the expression of the genetic message (replication, translation and transcription).
4. Understand the interactions between (micro) organisms and the environment, microbial ecology and the influence of (micro) organisms on different ecosystems.

Biology and Ecology. Notions of physiology, zoology and botany. Knowledge of genetics, biochemistry and metabolism. Study of organisms and their environment, population dynamics, material and energy flows and changes in ecosystems and biodiversity.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	40,0	26.67
Hours small group	20,0	13.33

Total learning time: 150 h

CONTENTS

Introduction to Biology

Description:

Introduction to Biology
Biomolecules

Full-or-part-time: 9h 36m

Theory classes: 4h
Self study : 5h 36m



Cell Biology

Description:

Development of the basic concepts of life, such as the hierarchical organization from the atoms and macromolecules that characterize organisms to the basic unit of life, the cell.

The different sessions will deal with:

The Cell
Metabolic pathways
Genetics
Laboratory (Session 1)

Full-or-part-time: 28h 47m

Theory classes: 8h
Laboratory classes: 4h
Self study : 16h 47m

Biodiversity

Description:

This content presents the main characteristics of the different domains, both prokaryotes (bacteria and archaeas) and eukaryotes (protists, animals, plants and fungi). Mechanisms of natural selection, adaptation and evolution are also presented.

The different sessions are:

Evolution Theory
Monera and Protista Kingdom
Fungi kingdom
Vegetal Kingdom
Plant Biodiversity
Animal Kingdom
Laboratory (Session 2)

Full-or-part-time: 43h 12m

Theory classes: 10h
Laboratory classes: 8h
Self study : 25h 12m

Ecology

Description:

Introduction to the basic concepts of ecology that allow us to describe the different ecosystems (food chains, energy flows, biomass, production, ecological niche, ...).

The different cycles of matter will be developed, paying special attention to the dynamics of ecosystems and the concept of ecological succession, applied to terrestrial and aquatic ecosystems.

The different sessions will be:

Introduction to Ecology
Physical environment
Population Ecology
Population Study
Community Ecology
Ecosystem Ecology
Biogeographic ecology
Laboratory (Session 3)

Full-or-part-time: 38h 24m

Theory classes: 12h
Laboratory classes: 4h
Self study : 22h 24m



The Human Being and the Biosphere

Description:

This section presents the concepts that allow the impact of human activity to be related to the environment. The demographic evolution of the species and the impact on food production are analyzed. It will be analyzed how the different types of human-generated pollution can alter the balance of ecosystems and the concept of sustainable economy is introduced.

The sessions will be:

Population growth, resources and sustainability

Habitat loss and conservation

Climate change

Full-or-part-time: 24h

Theory classes: 6h

Laboratory classes: 4h

Self study : 14h

GRADING SYSTEM

Ordinary Evaluation (OE)

The qualification of the continuous assessment is the weighted arithmetic mean of the exercises/problems (Pr) carried out during the course, of the activities directed as practices or reports (Tr) and of two Exams (Ex, which will have the same value).

There will be two partial exams and they will count for 70% of the grade. Problems will count 10% and directed activities will count 20%.

The final grade will be

$EO = 0.7 * (\text{average of Ex1 and Ex2}) + 0.1 * (\text{average of Pr}) + 0.2 * (\text{average of Tr})$.

To pass, the EO grade must be greater than or equal to 5.

Re-evaluation (RE)

Qualification and admission criteria for reassessment (Re): Students who have failed the ordinary evaluation and who have regularly taken the evaluation tests of the failed subject will have the option of taking a re-evaluation test in the period set in the academic calendar. Students who have already passed, or students rated as not submitted or who have not handed in all the exercises/problems (Pr) and the papers and reports (Tr) may not take the reassessment test of a subject.

The reassessment (RE) will consist of a single exam that covers all the content of the course. The maximum grade for the reassessment will be five (5.0) and the final grade for the course will be the maximum grade between the continuous assessment and the reassessment exam, that is, $MAX(EO/RE)$. The non-attendance of a student summoned to the re-evaluation test, held in the set period, may not lead to another test at a later date.

Extraordinary evaluations will be carried out for those students who, due to accredited force majeure, have not been able to take any of the continuous evaluation tests. These tests must be authorized by the corresponding head of studies, at the request of the professor responsible for the subject, and will be carried out within the corresponding school period.

EXAMINATION RULES.

If any of the laboratory or continuous assessment activities are not carried out in the scheduled period, it will be considered a zero score. The tests will be carried out individually, with multiple choice questions that can be theoretical or problem type questions. The exams can include, in addition to multiple choice questions, short questions to be developed by the students and exercises to be solved.

BIBLIOGRAPHY

Basic:

- Solomon, E.P.; Berg, L.R.; Martin, D.W. Biología. 9a ed. México: Cengage Learning Editores, 2013. ISBN 9786074819335.

- Smith, T.M.; Smith, R.L. Ecología [on line]. 6a ed. Madrid: Addison Wesley, 2007 [Consultation: 08/02/2021]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1293. ISBN 9788478290840.

- Hickman, C.P. Principios integrales de zoología [on line]. 14a ed. Madrid: McGraw-Hill, 2009 [Consultation: 24/11/2020]. Available on: http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4152. ISBN 9788448168896.



Complementary:

- Campbell, n.; Reece, J. Biología. Buenos Aires ; Madrid: Panamericana, 2007. ISBN 9788479039981.
- Sadava, D. Vida: la ciencia de la biología. 8a ed. Buenos Aires: Médica Panamericana, 2009. ISBN 9789500682695.
- Margalef i López, R. Ecología. 5a ed. Barcelona: Planeta, 1992. ISBN 8432045802.