Course guides
2500200 - GECBIOLECO - Biology and Ecology

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

Degree: (ANG) GRAU EN ENGINYERIA AMBIENTAL (Syllabus 2020). (Compulsory subject).

Academic year: 2020  ECTS Credits: 6.0  Languages: Catalan, 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.

Generical:
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 2 hours per week of classroom activity (large size group) and 1 hour weekly with half the students (medium size group).

The 2 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1 hour in the medium size groups 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 weekly hours devoted to laboratory practice.

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Introduction to Biology

Description:
Introduction to Biology
Scientific Method

Full-or-part-time: 9h 36m
Theory classes: 2h
Practical classes: 2h
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
Applied Genetics
Laboratory (Session 1)

**Full-or-part-time:** 28h 47m
Theory classes: 6h
Practical classes: 4h
Laboratory classes: 2h
Self study: 16h 47m

### Biodiversity

**Description:**
This content presents the main characteristics of the different domains, both prokaryotes (bacteria and archaearas) 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
Animal Biodiversity
Laboratory (Session 2)

**Full-or-part-time:** 43h 12m
Theory classes: 10h
Practical classes: 2h
Laboratory classes: 6h
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: 8h
- Practical classes: 4h
- 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
- Presentations of Research Projects

**Full-or-part-time:** 24h
- Theory classes: 6h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 14h

### GRADING SYSTEM

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consist in several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.
EXAMINATION RULES.

The final grade will be obtained from the following formula:
Final exam (40%) + Personal research work (20%) + Two evaluation tests (20%) + Practices (10%) + Report of visit to the Museum (10%)

BIBLIOGRAPHY

Basic:

Complementary: