Course guides
2500205 - GECECAMBSO - Environmental Economics and Sustainability

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: (ANG) GRAU EN ENGINYERIA AMBIENTAL (Syllabus 2020). (Compulsory subject).
Academic year: 2020 ECTS Credits: 6.0 Languages: Catalan, Spanish, English

LECTURER
Coordinating lecturer: OSCAR ALFRANCA BURRIEL
Others: OSCAR ALFRANCA BURRIEL

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 principles of the sustainability of economic development are raised, questioning the limits of growth, international inequality and its environmental impact. Emphasis is placed on the allocation of resources with environmental effects (market errors, public goods, common resources and externalities). Environmental policies such as Pigouian taxes, environmental taxation, Coase’s theorem, emissions markets, and voluntary agreements are also presented. Environmental valuation methods such as travel cost, quota valuation and hedonic prices are presented. The cost-benefit analysis, including the environmental dimension, is also addressed. Finally, environmental accounting mechanisms are proposed at both the national and business levels.

1. Understand the concept, the institutional and legal framework of the company and have notions of its organization and management.
2. Apply environmental regulations in the field of a company.
3. Know the concept of economic and business sustainability.

Environmental Economics and Sustainability. Knowledge of the concept, institutional and legal framework of a company, its organization and management. Application of environmental regulations to the company and development of the concept of economic and business sustainability.

1. Understand the concept, the institutional and legal framework of the company and have notions of its organization and management. 2. Apply environmental regulations in the field of a company. 3. Know the concept of economic and business sustainability.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15.0</td>
<td>10.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6.0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30.0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>15.0</td>
<td>10.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84.0</td>
<td>56.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Introduction to economics

Description:

Specific objectives:
Introduce the basics of economic reasoning among environmental engineering students
Introduce among students the global vision of economics as a system
That students value what the economic variables represent if they measure to be able to introduce the environmental elements

Full-or-part-time: 28h 47m
Theory classes: 12h
Self study : 16h 47m
Environmental Economics

Description:
Elements to consider for an assessment of environmental assets. Use value, option value, existence value. Double focus: Natural Capital vs. environmental services
Different types of valuation elements: Induced costs, avoided costs, disclosed preferences, declared preferences, etc. Specific methods and applications: Travel cost, hedonic prices, contingent valuation. Real cases will be raised to comment and work in class on methods of assessing environmental externalities
Evaluation of projects and policies. Introduction to cost-benefit analysis (CBA) as a decision-making element. Inclusion of environmental assessments in the ACB. The problem of temporality and discount rates. The additivity of costs and benefits. Cost-benefit application guides. Quantification of environmental values in European Union guidelines. Real cases of cost-benefit analysis will be raised and the weight of environmental issues in decision-making will be worked on in class in a critical way. Analyze examples of infrastructures and projects with cost-benefit techniques that take into account the environmental impact

Specific objectives:
That students are aware of the importance of the relationship between economics and the environment. That economic decisions must take into account the environmental issue. A vision of the environment from the point of view of the engineer
Introduce in students that environmental issues affect market balances
Introduce students to the concept of externalities. That students understand the importance of externalities. How policies and actions may be affected by externalities and their assessment
Understand what it means to value environmental goods. Define the assessment of intangibles and their applicability to environmental issues. Discuss with students whether environmental goods can be valued and in what situations. Discuss whether they are comparable to the valuation of other assets
Familiarize students with the intangible valuation techniques currently used in environmental economics. Develop critical thinking among students about the ability to monetize environmental impacts and integrate them into decision making. Show the importance of evaluation to analyze engineering projects and policies that are carried out. That students learn to interpret the social and welfare viability of an investment project. Develop a critical view of the methodologies used to evaluate projects
Have students come up with a cost-benefit analysis and know how to do and evaluate it

Full-or-part-time: 57h 35m
Theory classes: 16h
Practical classes: 8h
Self study: 33h 35m
Circular Economy and Sustainability

**Description:**
Introduction to the concept of circular economy and sustainability. Sustainable development. Limits of growth. Technology and use of resources. Environment as an international concept: Kyoto Protocol and subsequent consensus
Examples around the circular economy and sustainability. Analysis of applied cases
Analysis of environmental policies. Class discussion of the instrument if the consequences
Work in class on cases and examples of business actions in the environmental field and their consequences.

**Specific objectives:**
Introduce the idea of sustainability and its consequences among students. Critical analysis of the economic model and its environmental consequences.
Introduce among students the idea of sustainability and its consequences. Critical analysis of the economic model and its environmental consequences.
Analyze instruments to minimize environmental impacts. Discuss the capacity of market self-regulation and the role of public administration.
Analyze instruments to minimize environmental impacts. Discuss the capacity of market self-regulation and the role of public administration.
Introduce companies and their responsibility in the environment. See if voluntary measures around corporate social responsibility is enough or is it a marketing model.
Introduce companies and their responsibility in the environment. See if voluntary measures around corporate social responsibility is enough or is it a marketing model.

**Full-or-part-time:** 57h 35m
Theory classes: 14h
Practical classes: 10h
Self study: 33h 35m

**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.

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**
- Aguilera, F.; Alcántara, V. (Comp.). De la economía ambiental a la economía ecológica [on line]. 1a ed., ed. electr. rev. Barcelona: