

Course guide

2500205 - GECECAMBSO - Environmental Economics and Sustainability

Last modified: 01/10/2023

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

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

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

LECTURER

Coordinating lecturer: OSCAR ALFRANCA BURRIEL, ÁLVARO GAROLA CRESPO

Others: ELISABET AGEA CARRERA, OSCAR ALFRANCA BURRIEL, ÁLVARO GAROLA CRESPO

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 subject consists of 4 hours a week of face-to-face classes in the classroom (large group). Theory classes will be combined with others structured around practical cases that serve to highlight the basic concepts that are explained in the supporting material. The cases presented in class will be recent real situations. It is a question of discussing in class about situations that can be found in their working life. They spend 2 hours in theoretical classes in a large group, in which the teachers explain the basic concepts and materials of the subject, present examples and do exercises. 2 hours (medium group) are devoted to problem solving with greater interaction with students. Practical exercises are carried out in order to consolidate the general and specific learning objectives. For each topic, learning material will be delivered that includes the main theoretical concepts of each of the subjects analyzed, as well as bibliography. Support material is used in the format of a detailed teaching plan through the ATENEA virtual campus: contents, programming of assessment and guided learning activities and bibliography.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

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.

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2. Apply environmental regulations in the field of a company.
3. Know the concept of economic and business sustainability.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

Introduction to economics

Description:

Concept of economy. Basic principles that govern economic thinking. Basis of economic analysis. Basic microeconomic concepts. Supply and demand, Types of goods. Concept of elasticity and its effects. Consumer Surplus, and Cost Theory
Introduction to macroeconomics. Global vision of the economy. Public sector participation
Paradigm of growth. Growth and development. Welfare measures. GDP and other indicators

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:

Interrelationships between economy and environment. Impacts of production models. Infrastructures and environment. Environmental Kuznets curve.

Elements that can affect market balances. Definition of Public Goods, Common Resources, Club Goods. Consequences and restrictions. Other factors that affect the market: Asymmetric information, uncertainties, temporality, income distribution.

Definition of externality. Positive and negative externalities. Consequences of Externalities on economic efficiency. Private vision. Coase's theorem and the agreements between affected agents. Impact and possibilities of articulation in environmental issues. Public view: regulations and fees.

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
Environmental regulations. Pigou taxes. Optimal rates. Market mechanisms. The example of the CO2 emissions market.
Analysis of environmental policies. Class discussion of the instrument if the consequences
Business and the environment. Corporate Social Responsibility and the role on the environment. Environmental accounting instruments. Environmental audits
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.
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Introduce companies and their responsibility in the environment. See if voluntary measures around corporate social responsibility is enough or is it a marketing model.
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Full-or-part-time: 57h 35m

Theory classes: 14h

Practical classes: 10h

Self study : 33h 35m

GRADING SYSTEM

The grade of the subject is obtained from the grades of continuous assessment. The continuous assessment consists of doing different activities, both individual and group, of an additive and formative nature, carried out during the course (inside the classroom and outside it). The assessment tests consist of a part with questions about concepts associated with the learning objectives of the subject in terms of knowledge or comprehension, and a set of application exercises. The final mark of the subject will be the one obtained from the qualifications obtained in the two types of activities according to the following weighting: Given this context, the following evaluable tests are proposed:

Two exams, each of which is worth 35 % of the grade of the subject.

A seminar, in the form of group work, which is worth 30% of the grade of the subject.

Students who fail the ordinary assessment who have regularly taken the assessment tests of the suspended subject will have the option of taking a re-assessment test in the period set in the academic calendar. Students who have already passed it or students who have qualified as not presented will not be able to take the re-assessment test for a subject. The maximum grade in the case of taking the re-assessment exam will be five (5.0). The non-attendance of a student summoned to the test of re-evaluation, celebrated in the fixed period will not be able to give rise to the realization of another test with later date. Extraordinary assessments will be performed for those students who, due to accredited force majeure, have not been able to take any of the continuous assessment tests. These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will be carried out within the corresponding teaching period.



BIBLIOGRAPHY

Basic:

- Field, B.C.; Field, M.K. Economía del medio ambiente. 3a ed. Madrid: McGraw-Hill, 2003. ISBN 8448139437.

Complementary:

- Lewis, L.; Tietenberg, T. Environmental economics and policy. 7th ed. Abingdon, Oxon ; New York: Routledge, 2020. ISBN 9781138587595.

- De Angelis, R. Business models in the circular economy: concepts, examples and theory [on line]. Cham: Springer International Publishing AG, 2018 [Consultation: 26/10/2020]. Available on: <https://ebookcentral.proquest.com/lib/upcatalunya-ebooks/detail.action?docID=5291747>. ISBN 9783319751276.

- Aguilera, F.; Alcántara, V. (Comp.). De la economía ambiental a la economía ecológica [on line]. 1a ed., ed. electr. rev. Barcelona: CIP-Ecosocial, 2011 [Consultation: 02/02/2021]. Available on: <https://drive.google.com/file/d/1q1jXbcMgAjoVfOjQ2atx8HOmmkYPjTw/view>. ISBN 8474262313.