

Ecomaterials and Sustainable Construction (250668)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA) Departament d'Enginyeria de Projectes i de la Construcció (EPC) Departament de Construccions Arquitectòniques I (CA I) Departament de Tecnologia de l'Arquitectura (TA)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA AMBIENTAL (pla 2014)
Course	2024/25

Main teaching language at each group

- Group 10ES2 Spanish (Q2)

Faculty

Responsible Faculty: Miren Etxeberria Larrañaga

Faculty: Antonio Aguado De Cea, Alberto De La Fuente Antequera, Miren Etxeberria Larrañaga, Lucia Fernandez Carrasco, Marta Gangoells Solanellas, Irene Josa I Culleré

Objectives of Education

CE01 - Apply scientific concepts to environmental problems and their correlation with technological concepts.

CE08-Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Explore scientific concepts and technical principles of quality management of the receiving means, atmosphere, water and soil, and applied to problem solving.

Explore scientific concepts and technical principles of management and treatment of gaseous emissions, water supply, sewage and waste and remediation techniques for groundwater and contaminated soils.

Sized systems for the treatment of major pollutants vectors in specific sectors of activity.

Interprets rules, identifies goals, assesses technical alternatives proposed unconventional solutions and priority actions.

Sustainability in the field of construction.

Environmental impacts: consumption of raw materials and energy and emissions.

Management and recovery of construction and demolition waste.

Valuation of other construction waste (industrial, urban, agricultural). Alternative raw materials.

Innovation in materials from sustainability. Ecomaterials.

Analysis of water flow.

Analysis of energy flow.

Assessment of the environmental impact of construction.

Characteristics of the construction sector

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

INTRODUCTION

Give an overview of the main parameters of the Construction Sector which condition their subsequent approach to sustainability

Define the life cycle and system boundaries. Explain existing processes at each stage, and the actors involved. Emphasize the interactions between them (borders), as points of problems.

Rationale of multicriteria methods for assessing sustainability. Explain MIVES. Examples of application in the sector.

Specific Objectives

Deepening the knowledge of their conditioning sector i

Describe the life cycle of the construction sector, analyzing the stages and actors involved in each

Explain a multi-method (MIVES) for the assessment of sustainability in the construction sector

TRADITIONAL AND INNOVATIVE MATERIALS

To introduce students to the use of traditional materials and ecological construction. The student will study and analyze the use of sustainable materials in the construction in order to minimize, from a production point of view, energy consumption and emission of greenhouse gases to the atmosphere.

The student will have the tools to evaluate products of different nature in building materials tools.

The student will achieve the necessary knowledge in the analysis and management of waste on site

The use of secondary materials (recycled aggregates, industrial by-products, sediments, etc.) make the new construction materials more sustainable, with less environmental impact. However, new construction materials must have similar or better physical-mechanical properties and durability, and they must be eco-efficient.

Specific Objectives

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Review of different types of waste used in construction. Management at work.

Identify and meet innovative materials from the point of view of sustainability. Examples of applications

Know how to determine the eco-efficiency of construction materials, and be able to define the most eco-efficient materials according to their application.

CONSTRUCTION AND DEMOLITION WASTE (CDW)

Analysis of obtaining construction and demolition waste and its treatment. Description of the treatment on-site and off-site, type of existing recycling plants.

Classification of types of recycled aggregates produced and their properties. Existing regulations according to their composition and regulated applications.

Due to the limiting properties of recycled aggregates to be used in the production of high-performance materials, research works have been carried out to improve their properties by surface treatments.

Analysis of obtaining construction and demolition waste and its treatment. Description of the treatment on-site and off-site, type of existing recycling plants.

A bibliographical analysis of the real cases carried out will be carried out. As well as a visit to a recycling

plant will take place.

There is a lot of waste that can be valued through recycling or reuse and used as a resource in the manufacture of construction materials.

Specific Objectives

Meet existing technologies for treatment of RCD to obtain an adequate quality of recycled aggregates.

Identify different types of recycled aggregates and their properties.

Know the different treatment techniques applicable to recycled aggregates to improve their properties and directly improve the properties of recycled concrete.

Meet existing technologies for treatment of RCD to obtain an adequate quality of recycled aggregates.

See real works carried out and gain awareness of possible applications.

Know and assess the most common waste to be valued through recycling. So the waste that can be reused.

ANALYSIS OF THE FLOW OF WATER

Water management in construction. Consumption in the manufacture of materials and execution of works. Management demanda. Sistemas catchment and water management. Recycling systems and water treatment and withdrawal

Specific Objectives

Describe the relationship of construccióny the water cycle and its relationship to lasostenibilidad.

- Identify and quantify flows aguaasociados construction processes.

ENERGY FLOW ANALYSIS

The energy consumption through the whole life cycle of the construction. Energy initially built, recurring embodied energy, operational energy and energy built demolition.

Regulations governing the energy consumption in the use phase of the building. Fundamental implications.

Phenomenology and response strategies to climate change. Mitigation and adaptation.

Specific Objectives

Describe the relationship between the building and the energy consumption and its relationship to sustainability.

To understand the regulations.

Identify and quantify energy flows associated with the construction process. Define and quantify improvement strategies.

EVALUATION

Teaching Methodology

The course consists of 1.5 hours per week of classroom activity (large size group) and 0.8 hours weekly with half the students (medium size group).

The 1.5 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 0.8 hours 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.

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.

Grading Rules

() The evaluation calendar and grading rules will be approved before the start of the course.*

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.

Test Rules

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

Office Hours

Office hours are preferably before or after classes. Another option is to send an email and agree on a specific schedule.

Bibliography

Basic

- Professors. Es donarà en cada sessió específica. 2014.