250668 - ECOCONSSOS - Ecomaterials and Sustainable Construction

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2015
Degree: MASTER’S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
MASTER’S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: ANTONIO AGUADO DE CEA
Others: ANTONIO AGUADO DE CEA, MIQUEL CASALS CASANOVA, MIREN ETXEBERRIA LARRAÑAGA, LUCIA FERNANDEZ CARRASCO

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

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.

Learning objectives of the subject
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

<table>
<thead>
<tr>
<th>Study load</th>
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<tbody>
<tr>
<td><strong>Total learning time:</strong> 125h</td>
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<tr>
<td>Theory classes:</td>
<td>15h</td>
<td>12.00%</td>
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<tr>
<td>Practical classes:</td>
<td>10h</td>
<td>8.00%</td>
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<tr>
<td>Laboratory classes:</td>
<td>10h</td>
<td>8.00%</td>
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<tr>
<td>Guided activities:</td>
<td>10h</td>
<td>8.00%</td>
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<tr>
<td>Self study:</td>
<td>80h</td>
<td>64.00%</td>
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**INTRODUCTION**

<table>
<thead>
<tr>
<th>Learning time: 16h 48m</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td>Self study : 9h 48m</td>
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**Description:**
- 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.

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**TRADITIONAL AND INNOVATIVE MATERIALS**

<table>
<thead>
<tr>
<th>Learning time: 16h 48m</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td>Self study : 9h 48m</td>
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</tbody>
</table>

**Description:**
- 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.

**Specific objectives:**
- 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.
<table>
<thead>
<tr>
<th>CONSTRUCTION AND DEMOLITION WASTE (CDW)</th>
<th>Learning time: 16h 48m</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 4h</td>
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<tr>
<td></td>
<td>Practical classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Self study: 9h 48m</td>
</tr>
<tr>
<td>Analysis of obtaining construction and demolition waste and its treatment. Description of the treatment on-site and off-site, type of existing recycling plants.</td>
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<tr>
<td>Classification of types of recycled aggregates produced and their properties. Existing regulations according to their composition and regulated applications.</td>
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</tr>
<tr>
<td>Analysis of obtaining construction and demolition waste and its treatment. Description of the treatment on-site and off-site, type of existing recycling plants.</td>
<td></td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
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</table>
**ENERGY FLOW ANALYSIS**

**Description:**
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.

**Learning time:** 16h 48m
- Theory classes: 4h
- Practical classes: 3h
- Self study: 9h 48m

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**EVALUATION**

**Learning time:** 9h 36m
- Laboratory classes: 4h
- Self study: 5h 36m

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**Qualification 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.

**Regulations for carrying out activities**
Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

**Bibliography**

**Basic:**
Professors. Es donarà en cada sessió específica. 2014.