250667 - VALANMBACO - Integrated Environmental Assessment of Building Materials

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Spanish, English

Degree competences to which the subject contributes

Specific:

13340. Apply scientific concepts to environmental problems and their correlation with technological concepts.

13347. Dimension unconventional systems and advanced treatment and raise their mass balance and energy.

Teaching methodology

The course consists of 3 hours per week of classes in the classroom (large group).

During the theoretical lectures, the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises. The practical sessions are devoted to solving practical problems and real cases with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

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.

Construction products. Historical development of characteristic materials.
Procedures for demolition and use of waste materials.
Deconstruction, separation and pretreatments.
Identification, characterization and utilization of waste from demolition and deconstruction.
Use in fillings, as aggregates in concrete and asphalt mixes.
Other industrial uses. Precast.
Environmental Assessment.
Leaching. Essays and limits.
Practical examples of application.

To give the student a broad and accurate methodological framework for assessing the environmental impact of different construction materials. Analyze the valuation of waste applicable as resources in the manufacture of construction materials.

To provide tools to establish strategies for recycling different materials by case studies.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>15h</th>
<th>12.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>10h</td>
<td>8.00%</td>
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<tr>
<td></td>
<td>Hours small group:</td>
<td>10h</td>
<td>8.00%</td>
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<td></td>
<td>Guided activities:</td>
<td>10h</td>
<td>8.00%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>80h</td>
<td>64.00%</td>
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## Content

| Chapter 1. Introduction | Learning time: 7h 11m  
Theory classes: 3h  
Self study: 4h 11m |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Introduction to the course. Comment an introductory reading</td>
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<tr>
<td>Types of scientific papers. Structure and analysis. Quality parameters of the research. Literature searches.</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
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<tr>
<td>To inform students about the development of the course</td>
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<tr>
<td>To distinguish different types of scientific documents and their structure. To learn to carry out literature searches. To know the parameters that indicate the quality of a scientific paper.</td>
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| Chapter 2. Leaching | Learning time: 13h 12m  
Theory classes: 1h 30m  
Practical classes: 2h 30m  
Laboratory classes: 1h 30m  
Self study: 7h 42m |
<table>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Definition. Leaching mechanisms and factors controlling leaching. Leaching scenarios.</td>
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<tr>
<td>Problems on leaching tests.</td>
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<tr>
<td>Interpretation of the results obtained through a leaching test.</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
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<tr>
<td>To know the characteristics of the leaching phenomena in construction and building materials.</td>
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<tr>
<td>To know the different laboratory tests used to evaluate the leaching process of a material.</td>
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<tr>
<td>To earn how to transform and use the data obtained from a leaching test.</td>
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<tr>
<td>To learn how to relate the data obtained in the laboratory with real case situations of application of a material.</td>
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| Chapter 3. Use of industrial waste in construction materials | Learning time: 16h 48m  
Theory classes: 2h 30m  
Practical classes: 2h 30m  
Laboratory classes: 2h  
Self study: 9h 48m |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Classification of industrial waste. Granular and powder.</td>
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<tr>
<td>Analysis of applications of granular waste as well as powder waste at the laboratory and real scale.</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
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<tr>
<td>Make a brief analysis of the characteristics that each type of waste present, with respect to their chemical composition (possible leaching problems) and their physical and mechanical properties.</td>
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<td>Know and have criteria to design and validate the use of waste in materials.</td>
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<tr>
<td>Chapter</td>
<td>Description</td>
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<tr>
<td>4. Utilization of waste in construction materials</td>
<td>Types of existing construction waste. Treatments and characteristics Use as filler, aggregate and asphalt binders. Other industrial uses. Precast products.</td>
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<tr>
<td>5. 69/5000 Utilization of dredging waste, sediment, plastics in materials</td>
<td>Describe the types of residues and their physico-chemical characteristics Procedures of obtaining, Identification, characterization and use of waste. Treatments Some Real cases will be described as well as laboratory work</td>
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<tr>
<td>6. Environmental Impact Assessment. Low embodied carbon material</td>
<td>The calculation basis of the carbon incorporated in materials Assess the actual cases carried out Choose a case and analyze</td>
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**Description:**

- Types of existing construction waste. Treatments and characteristics
- Use as filler, aggregate and asphalt binders. Other industrial uses. Precast products.

**Specific objectives:**

- To know what types of waste material are produced and their characteristics
- To know the main applications of wastes in construction

**Learning time:**

- Theory classes: 2h
- Practical classes: 2h 30m
- Laboratory classes: 2h
- Self study: 9h 06m

**Description:**

- Describe the types of residues and their physico-chemical characteristics
- Procedures of obtaining, Identification, characterization and use of waste. Treatments
- Some Real cases will be described as well as laboratory work

**Specific objectives:**

- To know the types of waste and their properties
- Know Treatments to be used in different applications
- To know alternative materials

**Learning time:**

- Theory classes: 2h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 8h 23m

**Description:**

- The calculation basis of the carbon incorporated in materials
- Assess the actual cases carried out
- Choose a case and analyze

**Specific objectives:**

- To know the built-in carbon of classic building materials and alternative materials
- Know the case studies performed
- To know the practice

**Learning time:**

- Theory classes: 3h 30m
- Practical classes: 1h 30m
- Laboratory classes: 2h
- Self study: 9h 48m
Qualification system

The qualification of the subject is obtained from the qualifications of the continuous evaluation (80%) and those corresponding to the tests of evaluation of theoretical concepts (20%).

The continuous evaluation consists of the realization of different activities and laboratory practices, both individual and group, of an additive and formative nature, made during the course (inside and outside the classroom).

The evaluation tests consist of questions about concepts associated with the learning objectives of the subject in terms of knowledge or understanding, and a set of application exercises.

Regulations for carrying out activities

80% assistance.
Delivering of all activities and laboratory works of the continuous assessment.

Bibliography

Basic:


Complementary: