240602 - Construction Sustainability

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 758 - EPC - Department of Project and Construction Engineering
Academic year: 2017
Degree: BACHELOR’S DEGREE IN MATERIALS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 4,5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: Eva Cuerva Contreras
Others: Eva Cuerva Contreras
         Carla Planas Rodríguez

Opening hours
Timetable: Appointment by email to: eva.cuerva@upc.edu

Prior skills
Basic knowledge of the building elements and systems. Basic knowledge of constructive language.

Degree competences to which the subject contributes

Specific:
1. Basic knowledge applied to environmental and sustainability technologies.

Transversal:
2. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
3. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
4. SUSTAINABILITY AND SOCIAL COMMITMENT. Being aware of and understanding the complexity of social and economic phenomena that characterize the welfare society. Having the ability to relate welfare to globalization and sustainability. Being able to make a balanced use of techniques, technology, the economy and sustainability.
5. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
6. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

Teaching methodology
Theory classes, lectures and participatory. Theoretical sessions will be combined with the approach of case studies to discuss and solve in the classroom.

Learning objectives of the subject
The main objective of the course is to convey to students the role of the building in sustainable development, particularly in environmental, because of its great influence on the overall consumption of resources and energy.
The specific objectives to be achieved are:
- Understand the concepts of sustainability relating to the building.
- Assess the determinants of a project or a building on the demand of sustainability.
- Evaluate both energy and resources consumed in the process of construction and implementation, and during the operational phase of the building.
- Know IT tools for design, and environmental certifications for assessing the sustainability of buildings.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group: 0h 0.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group: 30h 26.67%</td>
<td>Hours small group: 15h 13.33%</td>
</tr>
<tr>
<td>Guided activities: 0h 0.00%</td>
<td>Self study: 67h 30m 60.00%</td>
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</tbody>
</table>
## Content

| Introduction | **Learning time:** 1h 30m  
Theory classes: 1h 30m |
|--------------|--------------------------------------------------|
| **Description:**  
Introduction and objectives of the course | |

| Basic concepts of sustainability | **Learning time:** 9h  
Theory classes: 4h 30m  
Self study: 4h 30m |
|----------------------------------|---------------------------|
| **Description:**  
The concept of sustainability and institutional development. The three legs of sustainability: environmental, social and economic. The expression of building sustainability. Material flows and associated resources to the building. The Life Cycle Analysis applied to the building | |

| Environmental Analysis systems | **Learning time:** 24h  
Theory classes: 4h 30m  
Practical classes: 4h 30m  
Self study: 15h |
|---------------------------------|-----------------------------|
| **Description:**  
Critical analysis of the toolkit and procedures oriented to measure, evaluate and assess the levels of sustainability, both during design and implementation and maintenance phases.  
**Related activities:**  
Practical work 1: group work (2-3 people) implementing various aspects of environmental assessment systems for buildings. | |

| Building materials | **Learning time:** 21h  
Theory classes: 3h  
Practical classes: 3h  
Self study: 15h |
|--------------------|--------------------------------------------------|
| **Description:**  
Critical analysis of the current situation of the use of building materials in relation to the conditions of sustainability. Alternatives and strategies towards sustainability.  
**Related activities:**  
Practical work 2: In groups of 3-4 people, investigating the LCA of the main construction materials used in Catalunya. Since its origin, transportation to the place of use, use in work and final stage of use, with the possibility of recycling, reuse or controlled landfill disposal. The work will be briefly presented in class on the last day of the module Building Materials. | |
## Water management in the building

**Description:**
Critical analysis of the current situation of water consumption in the building in relation to the conditions of sustainability. Alternatives and strategies towards sustainability.

**Related activities:**
Practical work 3: In groups of 3-4, analyze water consumption weekly / monthly / yearly of the residence of the team members. Comparative analysis and proposed savings measures.

### Learning time:

<table>
<thead>
<tr>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Self study</th>
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<tbody>
<tr>
<td>4h 30m</td>
<td></td>
<td>15h</td>
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## Energy and CO2 emissions

**Description:**
Critical analysis of the current situation of energy consumption and generation of CO2 emissions associated with the use of the buildings in relation to the conditions of sustainability. Alternatives and strategies towards sustainability.

### Learning time:

<table>
<thead>
<tr>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>4h 30m</td>
<td>3h</td>
<td>8h</td>
</tr>
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</table>

## Bioclimatism and interior comfort

**Description:**

### Learning time:

<table>
<thead>
<tr>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>6h</td>
<td>3h</td>
<td>8h</td>
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</table>

## The setting of the building and sustainability

**Description:**
Analysis of the influence of the environment on the sustainability of the building. Building accessibility for disabled people. Integration of the building within the urban dithering. Proximity to public transportation.

### Learning time:

<table>
<thead>
<tr>
<th>Theory classes</th>
<th>Self study</th>
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<tr>
<td>1h 30m</td>
<td>2h</td>
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Qualification system

NF = 0.2 * NT1 + 0.2 * NT2 + 0.15 * NT3 + 0.1 * NEC + 0.35 * NEF

- NF: Final Mark
- NT1: Work 1 Mark
- NT2: Work 2 Mark
- NT2: Work 3 Mark
- NAC: Continuous assessment Mark
- NEF: Final exam Mark

Regulations for carrying out activities

There will be a written test control knowledge, which will consist of a review of the basic theoretical concepts. Students may not have any support material during this test. The practical work will be done in small groups (3-4 people) and will be presented orally to the class. During exposure, group members must participate equally and answer any questions posed by the teacher.

Bibliography

Others resources: