310407 - Advanced Materials in Building Construction

Coordinating unit: 310 - EPSEB - Barcelona School of Building Construction
Teaching unit: 753 - TA - Department of Architectural Technology
Academic year: 2019
Degree: MASTER'S DEGREE IN ADVANCED BUILDING CONSTRUCTION (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 5

Teaching languages: Spanish

Teaching staff
Coordinator: Monton Lecumberri, Joaquin
Others: Haurie Ibarra, Laia

Opening hours
Timetable: It will be defined at the beginning of the course

Prior skills
Knowledge about construction and materials

Degree competences to which the subject contributes

Basic:
2. Possess and understand knowledge which provide a basis or opportunity to be original in the development and/or application of ideas, usually in a context of research.
3. The students must be able to apply the acquired knowledges and their ability of resolution of problems in new or little known environments inside more wide environments (or multidisciplinary) related with their study field.
4. The students must be able to integrate knowledges and front to the complexity to formulate opinions from an information which, being incomplete or limited, includes reflections about the social and ethical responsibilities linked to the application of their knowledges and opinions.
5. The students must be able to communicate their conclusions and the knowledges and ultimate reasons which support to specialised and non-specialised audiences in a clear mode and without ambiguities.
1. The students must possess the learning abilities which allow them to continue studying in a way which should be to a large extent self-directed and autonomous.

Specific:
7. Define the characteristics of the seismic action and apply the present regulations to the seismic calculation of structures in building construction.
13. Capacity of innovation: identify the reasons and the mechanisms of the technologic and technical changes.

Generical:
8. Provide to the student the capacity to apply the knowledge acquired in the resolution of complex problems in any sector of the building construction.
9. Prepare to communicate with efficiency, orally but also in written.

10. Develop and/or apply ideas with originality in a context of investigation, identifying and formulating hypothesis or innovative ideas and submit them to a objectivity, coherence, and viability test.

Transversal:
11. ENTREPRENEURSHIP AND INNOVATION: Knowing about and understanding how businesses are run and the sciences that govern their activity. Having the ability to understand labor laws and how planning, industrial and
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marketing strategies, quality and profits relate to each other.

12. 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

The teacher will combine the dynamic classes with other activities such as experimental classes in the laboratory, technical visits, seminars and conferences and problem resolution.

Learning objectives of the subject

Train students in the use of new materials that are being incorporated or may be incorporated in the near future in the building sector. Use materials selection criteria and the currently existing tools.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 15h</th>
<th>12.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 5h</td>
<td>4.00%</td>
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<tr>
<td></td>
<td>Hours small group: 5h</td>
<td>4.00%</td>
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<tr>
<td></td>
<td>Guided activities: 10h</td>
<td>8.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>72.00%</td>
</tr>
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</table>
### Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New materials? Advanced materials?</strong></td>
<td>2h</td>
<td>In this chapter we pretend to open the discussion about the broad concept of new materials.</td>
</tr>
<tr>
<td><strong>Historical approach to new materials</strong></td>
<td>1h</td>
<td>This section will make a historical overview of new materials throughout history. Virtually all materials have been new materials at some point. The influence of its appearance will be analyzed in the world of construction and will be seen as affecting the techniques and forms of construction time.</td>
</tr>
<tr>
<td><strong>New manufacturing techniques of construction materials</strong></td>
<td>1h</td>
<td>This section describes the new manufacturing techniques of construction materials through which we can obtain new materials with properties superior to traditional or may significantly improve the properties of existing traditional materials are described.</td>
</tr>
<tr>
<td><strong>Solving real world problems using construction techniques and materials selection tools.</strong></td>
<td>4h</td>
<td>Description of different selection methods. Establishment of preconditions, geometric constraints, application, environmental conditions, etc. Detection of the most important parameters and selection of materials with improved properties. Using databases and software to aid the selection of materials (type CES Edupack)</td>
</tr>
</tbody>
</table>

**Learning time:**
- Theory classes: 2h
- Guided activities: 2h
<table>
<thead>
<tr>
<th><strong>Composites</strong></th>
<th><strong>Learning time:</strong> 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
</tbody>
</table>

**Description:**

<table>
<thead>
<tr>
<th><strong>Advanced ceramic materials</strong></th>
<th><strong>Learning time:</strong> 1h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 1h</td>
</tr>
</tbody>
</table>

**Description:**
In this section the most advanced and far superior performance to traditional ceramic products will be studied.

<table>
<thead>
<tr>
<th><strong>High performance glass</strong></th>
<th><strong>Learning time:</strong> 6h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
</tbody>
</table>

**Description:**
The glass has gained importance and a major presence in actual construction. In this section the most advanced products will be studied. A visit to a leading company in the glass construction will be conducted and visit buildings where the glass has a great importance.

<table>
<thead>
<tr>
<th><strong>High performance mortars and concretes</strong></th>
<th><strong>Learning time:</strong> 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
</tbody>
</table>

**Description:**
In recent years there have been mortars and concretes with high performance that enable new challenges in construction. This section will delve into this field.
### Nanotechnology in Construction

**Learning time:** 3h  
Theory classes: 1h  
Guided activities: 2h

**Description:**  
Nanotechnology is the word most fashionable in the world of new materials. In this section, the possible applications of nanomaterials in the construction world will be studied. Cements nanostructured. Nanoparticles as additions. Impregnation of traditionally difficult materials impregnated with nanosized preparations.

### Smart materials. Shape memory materials.

**Learning time:** 1h  
Theory classes: 1h

**Description:**  
Smart materials. Shape memory materials.

### Self-healing materials

**Learning time:** 1h  
Theory classes: 1h

**Description:**  
Along with smart materials, self-repairing materials offer a world of possibilities in the world of construction.

### Wood. New material?

**Learning time:** 3h  
Theory classes: 2h  
Practical classes: 1h

**Description:**  
From the wood, the most traditional of the construction materials, there is being developed a range of transformed products which are causing that the wood is considered as a new material.

### Qualification system

70% of the marks will correspond to different exercises that should cover the different topics treated during the course. The other 30% will be obtained through conventional evaluation tests along the course.
Bibliography

Basic:


Complementary: