310410 - Control and Evolution of Building Fires

Coordinating unit: 310 - EPSEB - Barcelona School of Building Construction
Teaching unit: 748 - FIS - Department of Physics
737 - RMEE - Department of Strength of Materials and Structural Engineering
732 - OE - Department of Management

Academic year: 2018
Degree: MASTER'S DEGREE IN ADVANCED BUILDING CONSTRUCTION (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 5  Teaching languages: Spanish

Teaching staff
Coordinator: Lacasta Palacio, Ana Maria
Others: Marimon Carvajal, Frederic

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 responsabilities 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:
6. Recognise the materials and construction techniques of each historical period and value its influence in the architecture design.
10. Use the physic principles in the thermic, luminic and acoustic scope.

Generical:
7. Provide to the student the capacity to apply the knowledge acquired in the resolution of complex problems in any sector of the building construction.
8. Analyse, evaluate and synthesize critically, new and difficult ideas of promotion, in academic and professional contexts, scientific advances, technologics, socials or culturals in the society of knowledge.

Transversal:
9. 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 marketing strategies, quality and profits relate to each other.
11. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
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.
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Teaching methodology

Blackboard classes: theory and problems.
Experimental and computational works.
Promotion of working in group

Learning objectives of the subject

- Acquisition of knowledge about the basics of generation and spread of fire.
- Acquisition of knowledge about the mechanisms of fire propagation in buildings.
- Learning about the behavior of materials when subjected to high temperatures.
- Acquisition of knowledge on the existing protection systems and to establish the most appropriate in each case.
- Knowing the fire simulation programs and understand the principles of operation.
- Acquisition of knowledge on the behavior of structures in fire

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>
</tr>
<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>
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<tr>
<td></td>
<td>Self study: 90h</td>
<td>72.00%</td>
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</tbody>
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Blackboard classes: theory and problems.
Experimental and computational works.
Promotion of working in group

Total learning time: 125h

Hours large group: 15h
Hours medium group: 5h
Hours small group: 5h
Guided activities: 10h
Self study: 90h

Study load

Teaching methodology

Blackboard classes: theory and problems.
Experimental and computational works.
Promotion of working in group
## Content

### Fires. Introduction

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emblematic fire examples. General evolution of worldwide standards against fire. Statistical analysis. Origin and most frequent causes of fires.</td>
<td>Theory classes: 2h</td>
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<td>Self study: 2h</td>
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### Physicochemical Fundamentals of Fire

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 15h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 12h</td>
</tr>
</tbody>
</table>

### Behavior of materials against fire

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 22h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire reaction of material. Smoke generation and toxicity. Improvement of materials to fire reaction: flame retardants and smoke suppressors. Fire resistance. Characterization tests. Regulations.</td>
<td>Theory classes: 3h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 1h</td>
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<tr>
<td></td>
<td>Self study: 16h</td>
</tr>
</tbody>
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### Related activities:

Experimental study about the behaviour against the fire of the materials. This work will be done in the fire lab of the EPSEB.
### Fire evolution in buildings

**Description:**

**Related activities:**
Utilization of the FDS software for the simulation of the fire spreading on buildings. This work will be done in the fire lab of the EPSEB.

**Learning time:** 30h
- Theory classes: 4h
- Practical classes: 2h
- Laboratory classes: 2h
- Guided activities: 2h
- Self study: 20h

### Human behavior under fire conditions

**Description:**

**Learning time:** 16h
- Theory classes: 2h
- Laboratory classes: 2h
- Self study: 12h

### Security of buildings in case of fire

**Description:**

**Related activities:**
Technical visit to a building.

**Learning time:** 16h
- Theory classes: 2h
- Practical classes: 2h
- Self study: 12h
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**Structural security**

**Description:**
High-temperature behavior of steel and concrete structures.

**Learning time:** 22h
- Theory classes: 4h
- Guided activities: 2h
- Self study: 16h

**Qualification system**

The final mark will be calculated from the qualification of four works.

**Bibliography**

**Basic:**