250721 - Advanced Materials in Construction

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 STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015).
ECTS credits: 5
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: ANTONIO AGUADO DE CEA
Others: ANTONIO AGUADO DE CEA, IGNACIO SEGURA PEREZ

Opening hours
Timetable: The hours will be concentrated during Friday morning. Alternatively, students can schedule directly with each teacher by e-mail.

Degree competences to which the subject contributes
Specific:
13365. Designing and building using traditional materials (reinforced concrete, prestressed concrete, structural steel, masonry, wood) and new materials (composites, stainless steel, aluminum, shape memory alloys?).
13367. To apply innovative and sustainable technological aspects in the management and implementation of projects and works.
13370. To analyze the multiple technical and legal conditions arising in the construction of public works, and use proven methods and proven technologies with the aim of achieving greater efficiency in construction while respecting the environment and protecting the safety and health of workers and users of public works.

General:
13361. To develop, improve and use conventional materials and new construction techniques to ensure the safety requirements, functionality, durability and sustainability.
13362. To define construction processes and methods of organization and management of projects and works.
13363. To design plans for safety, quality and environmental and socioeconomic impacts related to the construction process.

Teaching methodology
The course consists of 3.0 hours per week of classroom activity (large size group).
The 2.5 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 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
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Subject to know the properties of new materials in construction

- Knowledge of building materials associated with certain less standardized building systems. Knowledge of new materials through an integrated approach of the material within the entire construction process (planning, design, execution, operation and reintegration) - Ability to analyze future perspectives in the design of new materials and their possible applications in civil and building construction.


- Properties of new materials used in construction

- Knowledge about building materials associated with certain little standardized construction systems. Knowledge of new materials through an integrated approach considering the material in the entire construction process (planning, design, implementation, operation and reintegration)

- Ability to analyze future prospects in the design of new materials and their possible applications in construction.

- Design of materials under the requirements of the application and the construction technique.


**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Theory classes: 19h 30m</th>
<th>15.60%</th>
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<tbody>
<tr>
<td>Practical classes: 9h 45m</td>
<td>7.80%</td>
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</tr>
<tr>
<td>Laboratory classes: 9h 45m</td>
<td>7.80%</td>
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<tr>
<td>Guided activities: 6h</td>
<td>4.80%</td>
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<tr>
<td>Self study: 80h</td>
<td>64.00%</td>
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### Content

<table>
<thead>
<tr>
<th>Introduction</th>
<th><strong>Learning time:</strong> 7h 11m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
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<td></td>
<td>Self study: 4h 11m</td>
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</table>

**Description:**
Basics about conventional building materials

<table>
<thead>
<tr>
<th>Special concretes</th>
<th><strong>Learning time:</strong> 50h 24m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 18h</td>
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<tr>
<td></td>
<td>Practical classes: 3h</td>
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<td></td>
<td>Self study: 29h 24m</td>
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</tbody>
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**Description:**
Self-compacting concrete
High strength concrete
Sprayed concrete
Fiber reinforced concrete
Concrete with high aesthetic performance
High density concrete, lightweight concrete, porous concrete
Practical cases

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<tr>
<th>Other advanced materials</th>
<th><strong>Learning time:</strong> 36h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 9h</td>
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<tr>
<td></td>
<td>Laboratory classes: 6h</td>
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<tr>
<td></td>
<td>Self study: 21h</td>
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**Description:**
Controlled low strength material
Construction materials prone to biological growth
Smart building materials

### 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: