250709 - Nanotechnology 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).
(Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: IGNACIO CASANOVA HORMAECHEA
Others: IGNACIO CASANOVA HORMAECHEA

Opening hours
Timetable: Monday and Friday from 9:00 to 11:00

Degree competences to which the subject contributes

Specific:
13364. To conceive and design civil and building structures that are safe, durable, functional and integrated into its surroundings.
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?).
13366. To evaluate, maintain, repair and strengthen existing structures, including the historic and artistic heritage.
13368. Mathematically modelling structural engineering problems.
13369. To apply methods and advanced design software and structural calculations, based on knowledge and understanding of forces and their application to the structural types of civil engineering.

General:
13360. To conceive, design, analyze and manage structures or structural elements of civil engineering or building, encouraging innovation and the advance of knowledge.
13361. To develop, improve and use conventional materials and new construction techniques to ensure the safety requirements, functionality, durability and sustainability.

Teaching methodology
The course consists of 3 hours per week of classroom sessions in a classroom (large group).

They are dedicated to lectures 1.5 hours in a large group on which teachers exposed the basic concepts and materials of matter, presents examples and exercising.

The rest of weekly hours dedicated to tutorials and individual monitoring of the work commissioned.

Support material is used in the form of detailed teaching plan using the virtual campus ATENEA: content, programming and evaluation activities directed learning and literature.

Learning objectives of the subject
Subject to identify the main nanotechnology applications in the construction sector

Identification capability nanotechnologies major application in the field of construction and use techniques of nanometric


Study load

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 125h</th>
<th>Hours large group: 19h 30m</th>
<th>15.60%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 9h 45m</td>
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<td>7.80%</td>
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<tr>
<td></td>
<td>Hours small group: 9h 45m</td>
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<td>7.80%</td>
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<tr>
<td></td>
<td>Guided activities: 6h</td>
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<td>4.80%</td>
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<tr>
<td></td>
<td>Self study: 80h</td>
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<td>64.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Introductory concepts</th>
<th>Learning time: 24h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
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<tr>
<td></td>
<td>Practical classes: 2h</td>
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<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
<td></td>
<td>Self study: 14h</td>
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**Description:**
- Scale factors in construction
- Introduction to Nanotechnology
- Exercises of nanomaterials characterization
- Guided tour of the laboratories of the Center for Research in Nano-Engineering of the UPC

<table>
<thead>
<tr>
<th>Nanomaterials</th>
<th>Learning time: 36h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 15h</td>
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<tr>
<td></td>
<td>Self study: 21h</td>
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**Description:**
- Nanotechnology of Cement
- Nanotechnology of Admixtures
- Nanotechnology of Mineral Additions
- Nanotechnology of mortars and concretes
- Nanotechnology of asphalt mixes

<table>
<thead>
<tr>
<th>Energy, environment and economy</th>
<th>Learning time: 33h 36m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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<tr>
<td></td>
<td>Practical classes: 12h</td>
</tr>
<tr>
<td></td>
<td>Self study: 19h 36m</td>
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**Description:**
- Energy efficiency and environmental applications: case study
- Economic impact of nanotechnology in the construction sector
- Case analysis
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:


Complementary:
