Course guides
250716 - 250716 - Durability of Structures

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: MASTER'S DEGREE IN STRUCTURAL AND CONSTRUCTION ENGINEERING (Syllabus 2015). (Optional subject).
Academic year: 2020
ECTS Credits: 5.0
Languages: Spanish

LECTURER
Coordinating lecturer: MARILDA BARRA BIZINOTTO
Others: VICENTE ALEGRE HEITZMANN, DIEGO FERNANDO APONTE HERNÁNDEZ, MARILDA BARRA BIZINOTTO, SUSANA VALLS DEL BARRIO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
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:
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.
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 hours a week of classes in a classroom (large group) is dedicated to lectures 2 hours in a large group, in which he exposes the teaching materials and basic concepts of the subject, and presents examples performs exercises. Devotes one hour (Intermediate), solving problems with greater interaction with students. Practical exercises are conducted in order to consolidate the general and specific learning objectives. The rest of weekly hours dedicated to studies and homework.
LEARNING OBJECTIVES OF THE SUBJECT

Subject to introduce to the engineer the basic concepts that govern the behaviour of concrete in front of agressive environments

- Knowledge of the basic concepts that govern the concrete behavior under aggressive environments.


STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hours small group</td>
<td>9,8</td>
<td>7.83</td>
</tr>
<tr>
<td>Self study</td>
<td>80,0</td>
<td>63.95</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>9,8</td>
<td>7.83</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.80</td>
</tr>
<tr>
<td>Hours large group</td>
<td>19,5</td>
<td>15.59</td>
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</tbody>
</table>

Total learning time: 125.1 h

CONTENTS

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<th>Durability and sustainability.</th>
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<tbody>
<tr>
<td>Description:</td>
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<tr>
<td>Durability concepts. Durability and Sustainability.</td>
</tr>
<tr>
<td>Full-or-part-time: 2h 24m</td>
</tr>
<tr>
<td>Theory classes: 1h</td>
</tr>
<tr>
<td>Self study: 1h 24m</td>
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<table>
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<tr>
<th>Bases for the formulation of a durable concrete.</th>
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<tbody>
<tr>
<td>Description:</td>
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<tr>
<td>* Hydration of cement  * Genesis and features of the microstructure of the hydrated cement paste. * Additives and additions.</td>
</tr>
<tr>
<td>* The porous structure and transport mechanisms  * Shrinkage, creep and cracking.</td>
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<tr>
<td>Durability of concrete in:  * Natural waters * acids environment. Preventive actions.</td>
</tr>
<tr>
<td>Full-or-part-time: 24h</td>
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<tr>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Self study: 14h</td>
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Endogenous expansive reactions

**Description:**
Endogenous reactions attributable to the aggregates. Diagnosis. Preventive actions.

**Full-or-part-time:** 7h 11m
Theory classes: 3h
Self study: 4h 11m

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Physical deterioration of concrete

**Description:**

**Full-or-part-time:** 7h 11m
Theory classes: 3h
Self study: 4h 11m

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Durability of concrete in chemically aggressive media

**Description:**
Durability of concrete in Sulfatic and Marine environment.

**Full-or-part-time:** 7h 11m
Theory classes: 3h
Self study: 4h 11m

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Carbonation and chloride penetration

**Description:**
Carbonation and chloride penetration

**Full-or-part-time:** 7h 11m
Theory classes: 3h
Self study: 4h 11m

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Corrosion and durability of reinforcement

**Description:**
Corrosion and durability of reinforcement
Practice steel corrosion

**Full-or-part-time:** 12h
Theory classes: 3h
Laboratory classes: 2h
Self study: 7h
Calcium aluminate cements - CAC

Description:
Durability of concretes with calcium aluminate cements

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study: 4h 11m

Durability prediction models

Description:
Durability models for predicting the behavior of the concrete. Life cycle

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study: 4h 11m

Deterioration. Case studies.

Description:

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study: 4h 11m

Diagnosing causes of deterioration

Description:
Diagnosing causes of deterioration of the concrete structure

Full-or-part-time: 2h 24m
Practical classes: 1h
Self study: 1h 24m

Repairs

Description:
Repairs. Material and methods.

Full-or-part-time: 2h 24m
Theory classes: 1h
Self study: 1h 24m

GRADING SYSTEM

Continuous assessment will formulate written questions on the subject of the class will be delivered on paper at the beginning of the next class. All deliveries will be described and its absence a qualified zero. The course will approve the average ongoing assessments, which represent 30% of the note, a test will represent 30% of the final and will represent 40% of the note. The final work will be delivered on paper and will be presented orally in class (20 minutes).
EXAMINATION RULES.

Failure to perform a continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

BIBLIOGRAPHY

Basic: