Course guides
250707 - 250707 - Non-Linear Analysis and Behaviour of Concrete 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, English

LECTURER
Coordinating lecturer: ANTONIO RICARDO MARI BERNAT
Others: JESÚS MIGUEL BAIRÁN GARCÍA, ANTONIO RICARDO MARI BERNAT, EVA MARIA OLLER IBARS

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.
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.

Genereal:
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.

TEACHING METHODOLOGY

The course consists of 2.3 hours per week of classroom activity (large size group) and 0.3 hours weekly with half the students (medium size group).

The 2.3 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 0.3 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

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

Subject to deepen the nonlinear phenomena and their effects in reinforced and prestressed concrete structures

Deepening in the nonlinear phenomena of concrete structures. Capability to evaluate the influence of these mechanisms in their design and calculation.


STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>19,5</td>
<td>15.59</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.80</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>9,8</td>
<td>7.83</td>
</tr>
<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>
</tbody>
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Total learning time: 125.1 h

CONTENTS

Introduction

Description:
Introduction
Nonlinear analysis strategy

Full-or-part-time: 9h 36m
Theory classes: 4h
Self study : 5h 36m

Materials

Description:
Materials
Materials-problems

Full-or-part-time: 7h 11m
Theory classes: 2h
Practical classes: 1h
Self study : 4h 11m
Nonlinear analysis strategy

**Description:**
Structural analysis MEF

**Full-or-part-time:** 14h 23m
Theory classes: 6h
Self study : 8h 23m

Different analysis and evolutionary construction

**Description:**
Analysis time

**Full-or-part-time:** 14h 23m
Theory classes: 6h
Self study : 8h 23m

FEM analysis structural- rebar structures

**Description:**
Effects of deterioration and strengthening
Effects of shear
Shape memory alloys Safety in non-linear analysis Practical examples
Troubleshooting nonlinear miyançant software provided by teachers

**Full-or-part-time:** 43h 12m
Theory classes: 14h
Practical classes: 4h
Self study : 25h 12m

Assessment

**Full-or-part-time:** 4h 48m
Laboratory classes: 2h
Self study : 2h 48m

GRADING 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.
EXAMINATION RULES.

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: