Course guides
2500037 - GECCALCEST - Structural Design

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: BACHELOR’S DEGREE IN CIVIL ENGINEERING (Syllabus 2020). (Optional subject).
Academic year: 2021 ECTS Credits: 6.0 Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: LUIS MIGUEL CERVERA RUIZ
Others: LUIS MIGUEL CERVERA RUIZ, JOSE MANUEL GONZALEZ LOPEZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14410. Knowledge of the typology and calculation bases of prefabricated elements and their application in manufacturing processes. (Specific technology module: Civil Construction)
14411. Knowledge about the project, calculation, construction and maintenance of building works in terms of structure, finishes, facilities and own equipment. (Specific technology module: Civil Construction)

General:
14380. Scientific-technical training for the exercise of the profession of Technical Engineer of Public Works and knowledge of the functions of advice, analysis, design, calculation, project, construction, maintenance, conservation and exploitation.
14383. Ability to project, inspect and direct works, in their field.
14391. Conceive, project, manage and maintain systems in the field of construction engineering. Cover the entire life cycle of an infrastructure or system or service in the field of construction engineering. (Additional school competition).

TEACHING METHODOLOGY

The course consists of 4 hours per week of classes during the 15 weeks of the semester.
The approximate distribution of the 60 contact hours is as follows:
36 hours of lectures devoted to the exposition of the concepts and materials of the course.
12 hours of practical sessions devoted to the presentation of examples and exercises and problems.
4 hours laboratory and directed activities devoted to practical exercises to consolidate the objectives of general and specific learning of the subject.
8 hours devoted to assessment.
LEARNING OBJECTIVES OF THE SUBJECT


1 Capacity for the project, calculation, construction and maintenance of building works in terms of structure and foundation structures, finishes, facilities and own equipment.
2 Ability to identify different types of prefabricated elements and their calculation bases and capacity for their application in manufacturing processes.


STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Structural reliability and structural basis of design

Description:
Introduction. Semiprobabilista probabilistic representation and representation. Required reliability. Actions, action effects (surround, lines of influence) and combination of actions. Limit states. Structural reliability and structural design bases. Problems Structural reliability and structural design bases. Laboratory

Full-or-part-time: 28h 47m
Theory classes: 6h
Practical classes: 2h
Laboratory classes: 4h
Self study: 16h 47m
### Funicular Structures

**Description:**
Cables, Arcos.
Funicular Structures, Problems

**Full-or-part-time:** 9h 36m
- Theory classes: 2h
- Practical classes: 2h
- Self study: 5h 36m

### Second-order analysis

**Description:**
Slender columns, Isolated concrete column, Isolated concrete column and steel
Analysis of second order, Problems

**Full-or-part-time:** 9h 36m
- Theory classes: 2h
- Practical classes: 2h
- Self study: 5h 36m

### Plastic Analysis

**Description:**
Introduction to plastic design, Calculation plastic sections, Elastoplastic behavior of a beam isostatic, General Survey of statically indeterminate systems, Resolution of beams and frames by Theorem maximum and minimum, theorem combination of mechanisms.
Plastic calculation, Problems

**Full-or-part-time:** 19h 12m
- Theory classes: 4h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 11h 12m

### Plates

**Description:**
Differential Equation of Equilibrium of a plate with the Kirchhoff-Love hypothesis, Boundary Conditions, Navier solution for different types of loads, Evaluation of flat grates, Method of virtual frames by EHE and analysis of plates on point supports.
Plates, Problems

**Full-or-part-time:** 24h
- Theory classes: 6h
- Practical classes: 4h
- Self study: 14h
## Shells

**Description:**

**Full-or-part-time:** 19h 12m
- Theory classes: 4h
- Practical classes: 2h
- Laboratory classes: 2h
- Self study: 11h 12m

---

## Dynamic Analysis

**Description:**

**Full-or-part-time:** 33h 36m
- Theory classes: 8h
- Practical classes: 2h
- Laboratory classes: 4h
- Self study: 19h 36m

---

### GRADING SYSTEM

The final grade is the weighted average of the obtained periodic evaluation exercises (A), in the practical exercises in the practical classes and laboratories and guided activities (AD) and the compulsory labor (T). If a grade equal to or greater than 5.0 in the periodic evaluation obtenie, the final grade for the course is obtained as: \[ NF = 0,3 \times A + 0,3 \times AD + 0,6 \times T. \]

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

### 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: