Course guide
2500021 - GECESTRUCT - Structures

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). (Compulsory subject).
Academic year: 2022 ECTS Credits: 6.0 Languages: Spanish, English

LECTURER

Coordinating lecturer: LUIS MIGUEL CERVERA RUIZ, RICCARDO ROSSI BERNECOLI
Others: LUIS MIGUEL CERVERA RUIZ, ALEJANDRO CORNEJO VELÁZQUEZ, MOHAMMAD REZA HASHEMI, IVÁN RIVET FERNÁNDEZ, RICCARDO ROSSI BERNECOLI, RUBÉN ZORRILLA MARTÍNEZ

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14401. Ability to analyze and understand how the characteristics of structures influence their behavior. Ability to apply knowledge about the resistant operation of structures to size them according to existing regulations and using analytical and numerical calculation methods. (Common module to the Civil branch)

Generic:
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.

TEACHING METHODOLOGY

The course consists of 4 hours a week of classes during the 15 weeks of the semester. The approximate distribution of the 60 contact hours is:
15 hours of lectures devoted to the exposition of the concepts and basic materials for the course.
15 hours of practical sessions devoted to the presentation of examples and exercises and problems.
24 hours laboratory and directed activities devoted to practical exercises to consolidate the objectives of general and specific learning of the subject.
6 hours devoted to psychological testing.
LEARNING OBJECTIVES OF THE SUBJECT


1 Ability to understand and apply the fundamentals of structural analysis and to understand energy theorems and their utility.
2 Ability to apply equilibrium and compatibility methods to structural analysis.
3 Ability to perform analysis and calculation of structures through the using computer software.


STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>30,0</td>
<td>20.00</td>
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Total learning time: 150 h

CONTENTS

**Fundamentals of Structural Analysis**

Description:

Fundamentals of Structural Analysis. Problems
Fundamentals of Structural Analysis. Laboratory

Full-or-part-time: 33h 36m
Theory classes: 2h
Practical classes: 2h
Laboratory classes: 10h
Self study: 19h 36m
<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Full-or-part-time:</th>
<th>Theory classes:</th>
<th>Practical classes:</th>
<th>Laboratory classes:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stresses and Movements</strong></td>
<td>Differential equation of the deflection of a beam line. Navier formulas for planar structures. Elastic equations. Efforts and movements. Problems Efforts and movements. Laboratory</td>
<td>14h 23m</td>
<td>2h</td>
<td>2h</td>
<td>2h</td>
<td>8h 23m</td>
</tr>
<tr>
<td><strong>Work and Energy</strong></td>
<td>Work and energy. Work and energy in structural systems. Work and complementary work. Reciprocity theorems. Strain energy and complementary energy. Virtual work. Total potential energy. Theorems of Castigliano. Elastic supports and links.</td>
<td>33h 36m</td>
<td>4h</td>
<td>4h</td>
<td>6h</td>
<td>19h 36m</td>
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<tr>
<td><strong>Compatibility Method</strong></td>
<td>Bases of the method. Continuous beams: equation of three moments, support settlements, elastic supports. Frames. Imposed movements and deformations.</td>
<td>9h 36m</td>
<td>1h</td>
<td>1h</td>
<td>2h</td>
<td>5h 36m</td>
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</table>
**Equilibrium Method**

**Description:**
Bases of the method. Continuous beams: equation of the three rotations, support settlements, elastic supports. Frames: intrasliational and traslational frames
Balance Method. Problems
Balance Method. Laboratory

**Full-or-part-time:** 33h 36m
Theory classes: 4h
Practical classes: 4h
Laboratory classes: 6h
Self study : 19h 36m

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**Stiffness method**

**Description:**

Stiffness method. Problems
Stiffness method. Laboratory

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

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**GRADING SYSTEM**

The final qualification is the weighted average obtained in the exercises in the practices classes and guided activities (AD), periodic evaluation exercises (AV), and the final work of the course (T). The final grade for the course is obtained as: \[ NF = 0.4 \times A + 0.4 \times AD + 0.4 \times T \]

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.

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**EXAMINATION RULES.**

If you do not perform any activities of continuous assessment or final work subject in the scheduled period, is considered zero punctuation.
BIBLIOGRAPHY

Basic:

Complementary: