250728 - Foundation Structures

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: LUCA PELA
Others: JESÚS MIGUEL BAIRÁN GARCÍA, ANTONIO RICARDO MARI BERNAT, CLIMENT MOLINS BORRELL, LUCA PELA, PEDRO ROCA FABREGAT, MIQUEL RODRIGUEZ NIEDENFÜHR

Opening hours

Timetable: Please email the lecturers of the course.

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.
250728 - Foundation Structures

**Teaching methodology**

The course consists of 1.5 hours per week of classroom activity (large size group) and 0.8 hours weekly with half the students (medium size group).

The 1.5 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 0.8 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**

Specialization subject in conceptual and detailed design of foundations, retaining structures, and special foundations.

Specialization skills to design foundations of building structures, bridges, retaining walls and special structures, as well as their strengthening in case of existing structures.

## Content

<table>
<thead>
<tr>
<th>Content</th>
<th>Learning time: 14h 23m</th>
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<tbody>
<tr>
<td><strong>Introduction to foundation structures</strong></td>
<td></td>
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<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Performance requirements, standards for design</td>
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<tr>
<td>Mechanical parameters, testing and in-situ measurements, lateral earth pressure</td>
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<thead>
<tr>
<th><strong>Shallow foundations</strong></th>
<th>Learning time: 14h 23m</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Design of footings and special footings</td>
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<tr>
<td>Design of beams and mat foundations</td>
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<thead>
<tr>
<th><strong>Retaining walls</strong></th>
<th>Learning time: 14h 23m</th>
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<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Design of basement walls, gravity walls, cantilever walls, reinforced earth walls</td>
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<td>Diaphragm walls, anchored walls</td>
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<thead>
<tr>
<th><strong>Pile foundations</strong></th>
<th>Learning time: 7h 11m</th>
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<tr>
<td><strong>Description:</strong></td>
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<td>Pile caps, single piles, micro-piles, groups of piles</td>
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<tr>
<th><strong>Computer-aided design of foundations</strong></th>
<th>Learning time: 7h 11m</th>
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<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Design of mat foundation by engineering software</td>
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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.

**Qualification system**

**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.

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**Special foundations**

**Description:**
- Foundations of wind towers and vibrating machines
- Seabed foundations

**Learning time:** 14h 23m
- Theory classes: 6h
- Self study : 8h 23m

**Strengthening of foundations**

**Description:**
- Examples of strengthening of foundations

**Learning time:** 7h 11m
- Laboratory classes: 3h
- Self study : 4h 11m

**Exams**

**Learning time:** 14h 23m
- Laboratory classes: 6h
- Self study : 8h 23m
Bibliography

Basic:

Complementary: