250420 - PROJCONSGE - Geotechnical Design and Construction

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 GEOLOGICAL AND MINING ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (Teaching unit Optional)
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional)
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Teaching unit Optional)
MASTER'S DEGREE IN GEOTECHNICAL ENGINEERING (Syllabus 2015). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Spanish

Teaching staff
Coordinator: MARCOS ARROYO ALVAREZ DE TOLEDO
Others: MARCOS ARROYO ALVAREZ DE TOLEDO, ANTONIO GENS SOLE, ANTONIO LLORET MORANCHO

Opening hours
Timetable: Upon appointment

Degree competences to which the subject contributes

Specific:
8200. The ability to apply knowledge of soil and rock mechanics to the study, design, construction and operation of foundations, cuts, fills, tunnels and other constructions over or through land, whatever its nature and state, and whatever the purpose of the work.

Transversal:
8559. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding the mechanisms on which scientific research is based, as well as the mechanisms and instruments for transferring results among socio-economic agents involved in research, development and innovation processes.
8560. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
8561. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
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Teaching methodology

The course consists of three hours per week (on average 1.5 of theory and 1.4 problems addressed to the solution of real cases). Two assessments are conducted throughout the year, one in an intermediate stage and one at the end.

Support material is used for the detailed teaching plan through the virtual campus ATENEA: content, programming and evaluation activities, directed learning and recommended literature.

Learning objectives of the subject

Specialization subject in which knowledge on specific competences is intensified.

Knowledge and skills at specialization level that permit the development and application of techniques and methodologies at advanced level.

Contents of specialization at master level related to research or innovation in the field of engineering.

This course has two objectives: to learn to develop a complete geotechnical project (using an actual case) and to know the most important techniques of geotechnical construction including: instrumentation, soil improvement, geosynthetics and soil structure interaction.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Theory classes: 19h 30m</th>
<th>15.60%</th>
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## Content

### Geotechnical project

**Description:**
Presentation of the course. Introduction to the Geotechnical project. Presentation of the "case of the foundation of the Water Treatment Plant of Baix Llobregat."

1: Analysis of previous geological information. Analysis of "in situ" tests. Critical analysis of the results of laboratory tests.
Activities in groups: Proposal for site investigation. Proposed geological model. Proposed laboratory testing campaign. Parameters obtained from laboratory tests.

2: Continuation of the case study: the initial model. First estimate of the behavior (total settlements and evolution over time). Preload test. Test design. Analysis of results.
Activities for groups: Proposed Model (parameters and stratigraphy). Calculating the primary settlements. Predicting the evolution of the deformation of the soil as a function of depth. Predicting the effect of partial unloading in the evolution of settlements with time.


**Learning time:** 21h 36m
- Theory classes: 3h
- Practical classes: 6h
- Self study: 12h 36m

### Soil-structure interaction

**Description:**
Activities for groups: Develop a spreadsheet to an infinite beam with various loads using the Winkler model. Calculation of the elastic modulus from the results of a load plate test.

Activities for groups: Using PLAXIS program for calculating the settlements of a circular plate with different constitutive models. Computing the subgrade modulus from the numerical results for various plate sizes.

**Learning time:** 14h 23m
- Theory classes: 3h
- Practical classes: 3h
- Self study: 8h 23m
## Evaluation

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

## Instrumentation

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

**Description:**  

## Ground improvement

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

**Description:**  

## Geosynthetics

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

**Description:**  
Main types of geosynthetics: characteristics and manufacturing processes. Main functions of geosynthetics and applications in which these functions are most relevant. Principles of design with geosynthetics. Most important geosynthetics characterization tests.

## Engineering case

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

**Description:**  
The construction design of a real geotechnical case is developed interactively. The case integrates, in a structured manner, elements of instrumentation, soil improvement, geosynthetics and soil-structure interaction.
Qualification system

There will be two exams: one in an intermediate stage of the course (Note: Nint) and at the end of the course (Note: Nend).

The screening tests consist of a part with questions on concepts associated with the learning objectives of the course to assess knowledge and understanding, and another part with application exercises.

The rating is obtained from the maximum of: nEnd or (0.4 * Nint + 0.6 * Nend)

Regulations for carrying out activities

In the final exam, all the course matter will be considered regardless of the grade in the intermediate examination.

Bibliography

Basic:
