Course guide
250420 - PROJCONSGE - Geotechnical Design and Construction

Last modified: 28/03/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: MASTER'S DEGREE IN GEOTECHNICAL AND EARTHQUAKE ENGINEERING (Syllabus 2009). (Optional subject).
MASTER'S DEGREE IN CIVIL ENGINEERING (PROFESSIONAL TRACK) (Syllabus 2012). (Optional subject).
MASTER'S DEGREE IN GEOLOGICAL AND MINING ENGINEERING (Syllabus 2013). (Compulsory subject).
MASTER'S DEGREE IN GEOTECHNICAL ENGINEERING (Syllabus 2015). (Optional subject).

Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: MARCOS ARROYO ALVAREZ DE TOLEDO

Others: MARCOS ARROYO ALVAREZ DE TOLEDO, IVAN PUIG DAMIANS

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.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

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

Type	Hours	Percentage
Hours small group	9,8	7.83
Self study	80,0	63.95
Hours medium group	9,8	7.83

Type	Hours	Percentage
Hours large group	25,5	20.38

Total learning time: 125.1 h

CONTENTS

Geotechnical project

Description:
Presentation of the course. Introduction to the Geotechnical project. Eurocode EC7
Different geotechnical specialists will present particular examples of projects, in different geotechnical, geographical and professional contexts

Full-or-part-time: 21h 36m
Theory classes: 3h
Practical classes: 6h
Self study : 12h 36m

Instrumentation

Description:
Introduction. Objectives of the instrumentation. Monitoring systems: strength and stresses, water pressures, displacements and deformations. Characterisitcs and limitations. Development of a geotechnical instrumentation project. Tips for good practice. Typical instrumentation examples.

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

Ground improvement

Description:
Introduction. Preloading and prefabricated vertical drains. Vibro-compaction and dynamic compaction. Stone columns. Deep soil mixing. Freezing. Grouting in rocks and soils. Jet grouting. Compensation groutingion. Advantages and limitations of the various methods. Examples of application.

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

Evaluation

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

Geosynthetics

Description:
Main types of geosynthetics: charactersitics 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.

Full-or-part-time: 7h 11m
Theory classes: 3h
Self study : 4h 11m

Soil-structure interaction

Description:

Winkler model. Elastic models. Solutions for simple cases of soil-structure interaction. Approximate numerical methods. Determination of parameters related to the deformability.
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.

Macroelements as a generalization of the winkler model. Py models for piles

Full-or-part-time: 14h 23m
Theory classes: 3h
Practical classes: 3h
Self study : 8h 23m

Engineering case

Description:
Characteristics of the project of reinforced soils with inclusions

Full-or-part-time: 7h 11m
Practical classes: 3h
Self study : 4h 11m

GRADING 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)

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:
- Dunnicliff, J.. Geotechnical instrumentation for monitoring field performance. New York: John Wiley & sons, 1993. ISBN 0471005460.
- Koerne, R.M. Designing with geosynthetics. 6th ed. Indianapolis: Xlibris, 2012. ISBN 9781462882892.