

Geotechnical Design and Construction (250420)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) MÀSTER UNIVERSITARI EN ENGINYERIA DE CAMINS, CANALS I PORTS (pla 2012) MÀSTER UNIVERSITARI EN ENGINYERIA DEL TERRENY (pla 2015) PARS: ENGINYER/A DE CAMINS, CANALS I PORTS (pla 2022)
Course	2024/25

Main teaching language at each group

- Group 10ES1 Spanish (Q1)

Faculty

Responsible Faculty: Marcos Arroyo Alvarez De Toledo
Faculty: Marcos Arroyo Alvarez De Toledo, Ivan Puig Damians

Objectives of Education

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.

Total hours of student work

		Hours	Percentage
Supervised Learning	Large group	25.5 h	56.67 %
	Medium group	9.75 h	21.67 %
	Laboratory classes	9.75 h	21.67 %
	Guided Activities	0.0 h	0.00 %
Self Study		80.0 h	

Contents

Geotechnical project

Escola de Camins

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

Instrumentation

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

Ground improvement

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 grouting. Advantages and limitations of the various methods. Examples of application.

Evaluation

Geosynthetics

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.

Soil-structure interaction

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

Engineering case

Characteristics of the project of reinforced soils with inclusions

Activities

Assessed supervised work

Development of a geotechnical project

Dedication

6h

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.

Grading Rules

() The evaluation calendar and grading rules will be approved before the start of the course.*

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 $(0.4 * Nint + 0.6 * Nend)$

Test Rules

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

Office Hours

Upon appointment

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.