

Course guide

250815 - 250815 - Modern Monitoring Techniques for Ground Movements

Last modified: 25/01/2024

Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.
Degree: MASTER'S DEGREE IN GEOTECHNICAL ENGINEERING (Syllabus 2015). (Optional subject).
Academic year: 2023 **ECTS Credits:** 5.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: JOSE ANTONIO GILI RIPOLL
Others: CLÀUDIA ABANCÓ MARTÍNEZ DE ARENZANA, ALESSANDRA DI MARIANO SIMONCINI, JOSE ANTONIO GILI RIPOLL

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

13309. To characterize the geological environment and its interaction with civil works.
13310. To interpret laboratory tests and field observations so as to identify the mechanisms responsible for soil response. To propose laboratory testing programmes.
13312. To analyze, discriminate and integrate geological and geotechnical information in studies and projects.
13313. To apply the knowledge on soil and rock mechanics to the development of the study, design, construction and exploitation of foundations, excavations, embankments, tunnels and other constructions on or through the soils, regardless of their nature and state or the finality of the works under study. (Specific competence of the specializations in Geotechnical Engineering and Earthquake Engineering and Geophysics).
13326. To use, in a discriminate manner, commercial software for numerical calculations in order to design and eventually monitor geotechnical structures. (Specific competence of the specialization in Geotechnical Engineering).

Generical:

13300. To apply advanced knowledge in sciences and technology to the professional or research practice.
13303. To evaluate the impact of Geo-engineering on environment, sustainable social development and the significance of working within reliable and consciensous professional environment.
13304. To incorporate new technologies and advanced tools in Geo-engineering into profesional and research activities.
13305. To conceive Geo-engineering as a multi-disciplinary field that includes relevant aspects from geology, sismology, hydrogeology, geotechnical and earthquake engineering, geomechanics, physics of porous media, geophysics, geomatics, natural hazard, energy and climate interactions.
13306. To promote innovation for the development of methodology, analyses and solutions in Geo-engineering
13307. To tackle and solve advanced mathematical problems in engineering from the drafting of the problem to the development of formulation and further implementation in computer programs. Particularly, to formulate, code and apply analytical and numerical advanced computational tools to project calculations in order to plan and manage them as well as to interpret results in the context of Geo-engineering and Mining engineering.

TEACHING METHODOLOGY

This subject consists of three hours of classes per week in the classroom. Not all the weeks we'll have class because the student will devote part of the time to develop the so-called "First activity" and "Second activity", which end with a presentation to the group.

During the execution of these activities it is essential the mentoring and consultation with the teacher.

In addition, there will be a couple of visits to places or institutions with monitoring tasks, in order to consolidate the general and specific learning objectives.

This subject uses the Virtual Campus Atenea to provide some material of support, to interact with students and to task delivery.

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

To conceive soils and rocks as porous media governed by Solid and Fluid Mechanics.

To characterize the geological environment and its interaction with civil works.

To interpret laboratory tests and field observations so as to identify the mechanisms responsible for soil response. To propose testing programmes.

To analyze, discriminate and integrate geological and geotechnical information in studies and projects.

To apply the knowledge on soil and rock mechanics to the development of the study, design, construction and exploitation of foundations, excavations, embankments, tunnels and other constructions on or through the soils, regardless of their nature and state or the finality of the works under study (Specific competence of the specialties in Geotechnical Engineering and Earthquake Engineering and Geophysics).

To analyze, from the perspective of an expert, cases of failure in Geotechnical Engineering. To report the evidences, identify the mechanisms responsible for the failure and verify using back- analysis models. Eventually provide solutions to risk reduction. (Specific competence of the specialization in Geotechnical Engineering).

To realize studies of land management and urban spaces, including construction of tunnels and other underground infrastructures. (Specific competence of the specialization in Geotechnical Engineering).

To use, in a discriminate manner, commercial software for numerical calculations in order to design and eventually monitor geotechnical structures. (Specific competence of the specialization in Geotechnical Engineering).

* To identify and characterize the materials and forms resulting from current and quaternary geological processes (flooding, flash floods, slides, fault activity), to determine the mechanisms operating, to estimate the intensity and frequency of the processes.

* To know the instrumentation and ground movement auscultation techniques and to correctly use the auscultation results.

* To be able to analyze the stability of an excavation or natural slope.

* To know the measures of stabilization, containment and protection of slope movements.

* To be able to carry out the quantitative evaluation of the risk of instability of slopes and excavations.

- Classical geometrical techniques: Topography and photogrammetry.

- Monitoring with geomechanical techniques.

- Precision GPS system applied to landslide measuring.

- Laser scanning (scan-laser or LIDAR).

- RADAR active remote sensing techniques.

- Other techniques.

- Error evaluation and adjustment of observations.

- Real applications to slopes, subsidence due to mining extractions, seismic movements, bridges and other structures.

STUDY LOAD

Type	Hours	Percentage
Hours large group	25,5	20.38
Self study	80,0	63.95
Hours small group	9,8	7.83



Type	Hours	Percentage
Hours medium group	9,8	7.83

Total learning time: 125.1 h

CONTENTS

Introduction to the course and monitoring principles

Description:

Session 2, item 1.
session 2, item 1.

Full-or-part-time: 14h 23m

Theory classes: 6h
Self study : 8h 23m

First activity

Description:

Session 1, item 2.
Session 2, item 2.
Session 5, item 1.
Session 4, item 2
Session 5, item 2

Full-or-part-time: 50h 24m

Practical classes: 12h
Laboratory classes: 9h
Self study : 29h 24m

Second activity

Description:

Session 1, item 3
session 2, item 3
Session 3, issue 3
Session 4, item 3

Full-or-part-time: 43h 12m

Practical classes: 9h
Laboratory classes: 9h
Self study : 25h 12m

GRADING SYSTEM

The rating will be obtained from the continuous assessment marks and the corresponding deliveries of the two activities.

Continuous assessment involves the active participation of students in the different sessions during their presentations, so as asking questions during other colleagues presentations. The consultancy sessions student-teacher during the preparation of the activities 1 and 2 are also taken into account.



EXAMINATION RULES.

There are no partial or final exams. Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

BIBLIOGRAPHY

Basic:

- Settles E. , Schafer. Slope monitoring methods, a state of the art report [on line]. 2008 [Consultation: 29/04/2020]. Available on: <https://geotechpedia.com/Publication/Author/7098/Schafer-T->.
- Dunicliff, J.. Geotechnical instrumentation for monitoring field performance. New York: John Wiley & sons, 1993. ISBN 0471005460.