

Modern Monitoring Techniques for Ground Movements (250815)

General Information

School	ETSECCPB
Departments	Departament d'Enginyeria Civil i Ambiental (DECA)
Credits	5.0 ECTS
Programs	MÀSTER UNIVERSITARI EN ENGINYERIA DEL TERRENY (pla 2015)
Course	2023/24

Faculty

Responsible Faculty: Jose Antonio Gili Ripoll

Faculty: Clàudia Abancó Martínez De Arenzana, Alessandra Di Mariano Simoncini, Jose Antonio Gili Ripoll

Objectives of Education

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.

Competencies

Especific

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 laboratory 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 specializations in Geotechnical Engineering and Earthquake Engineering and Geophysics).

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).

Generic

To apply advanced knowledge in sciences and technology to the professional or research practice.

To evaluate the impact of Geo-engineering on environment, sustainable social development and the significance of working within reliable and consciensous professional environment.

To incorporate new technologies and advanced tools in Geo-engineering into profesional and research activities.

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.

To promote innovation for the development of methodology, analyses and solutions in Geo-engineering

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.

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

Introduction to the course and monitoring principles

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

First activity

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

Second activity

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

Activities

visit 1

Visit 1 companies, organizations, institutes, field or actual works, all within the field of monitoring

Dedication

3h

visit 2

Description of the activity test 1

Dedication

3h

Log evaluation, item 2 (an activity evaluable)

Dedication

3h

Log evaluation, item 3 (activity evaluable)

Dedication

3h

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.

Grading Rules

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

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.

Test 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.

Office Hours

Wide availability throughout the week, in person or by email.

Bibliography

Basic

- Settles E. , Schafer. Slope monitoring methods, a state of the art report. 2008.
- Dunnicliff, J. [Geotechnical instrumentation for monitoring field performance](#). New York: John Wiley & sons, 1993. ISBN 0471005460.