

26446 - Geotechnics and Geophysical Prospecting

Syllabus Information

Academic year: 2024/25

Subject: 26446 - Geotechnics and Geophysical Prospecting

Faculty / School: 100 - Facultad de Ciencias

Degree: 588 - Degree in Geology

ECTS: 6.0

Year: 4

Semester: First semester

Subject type: Compulsory

Module:

1. General information

The subject and its expected results respond to the following approaches and objectives:

Acquire working techniques in geotechnical and geophysical prospecting, with a good understanding of the concepts, models and theories that underlie this discipline and that determine how to work with ground properties and their determination through laboratory or in situ tests and how they influence the relevant calculations.

2. Learning results

Upon completion of this subject, the student must prove they know the following results

- Fundamentals of soil mechanics
- Basic concepts and terminology of the discipline.
- Know and handle the unified classification of soils and the necessary parameters and tests for it.
- Know how to calculate the vertical load induced by the weight of geological materials in terms of total and effective stresses.
- Know how to calculate the increase of vertical stress induced by loads distributed on transmitting surfaces.
- Know and handle the concepts of normally consolidated and overconsolidated soils.
- Know the Mohr-Coulomb failure criterion and handles Mohr's circle.
- Understand the rationale, operation and objectives of the different strength tests.
- Appreciate the importance of detecting problematic soils and how this information is integrated with other geological disciplines.
- Know the different types of foundations and associated structures.
- Know how to calculate the bearing capacity of a soil depending on the type of foundation.
- Know how to estimate settlements and settlement times.
- Know the criteria for planning a geotechnical survey.
- Know the types of slope failure in soils and know how to estimate their degree of stability.
- Learn about the main methods of slope stabilization.
- Geophysical prospecting methods and applications
- Know the physical fundamentals of the main methods.
- Learn about their applications and limitations.

3. Syllabus

- Module I. Geotechnics
 - Unit I. Fundamentals of soil mechanics
 - Topic 1. Basic aspects of soils.
 - Topic 2. Stresses in the underground.

- Topic 3. Consolidation.
- Topic 4. Soil shear strength.
- Unit II. Applications
 - Topic 5. Foundations in soils I.
 - Topic 6. Foundations in soils II.
 - Topic 7. Foundations in soils III.
 - Topic 8. Slopes in soils.
 - Topic 9. Lateral pressures.
- Module II. Geophysical prospecting
 - Unit III. Methods and applications
 - Topic 11. Electrical methods.
 - Topic 12. Seismic methods.
 - Topic 13. Georadar.

4. Academic activities

- Activity 1: Learning of conceptual and descriptive aspects and calculation bases.
 - * Participative master classes, (2.7 ECTS)
 - * Data processing and report writing (1.05 ECTS)
- Activity 2:
 - * Learning of instrumental procedures
 - Field practices (0.25 ECTS, 1 half day in the field)
 - * Office practices: (2 ECTS)

Throughout the term, both in practical and theoretical classes, bibliography and various internet resources in English will be used.

5. Assessment system

It will consist of two options:

I. Mixed system, which is composed of the following evaluation activities

- A) Answers to questionnaires in each class.
- B) Exercises complementary to the practices.
- C) Field report.
- D) Written test of numerical resolution of cases.

$$\text{grade} = (D \times 0.7) + (\text{subject average} \times 0.3)$$

Where written test refers to the practice exam described in the global evaluation test section, and "subject average" = $(A+B+C) / 3$

To pass, students must obtain: in D and B at least a 5 (out of 10); in A at least an 8 (out of 10).

II. Simple system, based exclusively on a final global test that will include:

- E) Written test similar to D, and
- F) an additional test, in which the student must demonstrate solvency in the basic use of the geophysical prospecting instruments of the syllabus, as well as the theoretical knowledge of the whole program

$$\text{Grade} = (E \times 0.7) + (F \times 0.3)$$

To pass, students must obtain: in E and F at least a 5 (out of 10).

6. Sustainable Development Goals

- 6 - Clean Water and Sanitation
- 9 - Industry, Innovation and Infrastructure