Universidad Zaragoza

Academic Year/course: 2021/22

28718 - Geotechnics

Syllabus Information

Academic Year: 2021/22
Subject: 28718 - Geotechnics
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 423 - Bachelor's Degree in Civil Engineering
ECTS: 6.0
Year: 2
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

The main objectives pursued with the course of Geotechnics in the degree in Civil Engineering are related to familiarizing the student with the different methodologies of work in this discipline. Thus, in addition to the teaching of the basic concepts, it is important in its practical aspects, through the realization of practical tests in the laboratory that the student will develop, and also through the approach and resolution of numerical geotechnical problems in the classroom.

Geotechnics deals with the intervention of natural materials in civil works, and therefore it is very important that the Civil Engineer knows how to assess the potential problems that may arise in relation to the natural support of these works (whether they are soils or rocks), what type of analytical methodologies exists for each case and, finally, how to work with the results of these analyzes and convert them in this way into recommendations and/or technical decisions.

1.2. Context and importance of this course in the degree

The location of this course in the second year of the degree is due to the interest of offering, to all Civil Engineering students, the basic concepts related to the soil study methodologies as a support substrate of any civil work, as well as to their behavior and interaction with them.

1.3. Recommendations to take this course

For an adequate development of the present course, it is convenient that the student has previously completed the so-called "Geological Engineering" course, of the first year of the degree, in which the basic concepts that will be developed in the course "Geotechnics" were presented.

2. Learning goals

2.1. Competences

Students are guaranteed to gain at least the following basic, general, and specific skills:

Basic skills:

- **CB1.** That students have shown that they possess and understand knowledge in the area of environmental sciences based on general secondary education, which tends be at a level that, even with the use of advanced textbooks, also includes certain aspects that involve avant-garde knowledge in their field of study.
- **CB2.** That students know how to apply their knowledge to their work or vocation professionally and possess skills that tend to be shown by the elaboration and defence of arguments and problem-solving within their area of study.
- **CB3.** That students have the capacity to bring together and interpret relevant data (normally within environmental

sciences) in order to make decisions that include a reflection on socially, scientifically or ethically relevant subjects.
- **CB4.** That students can transmit information, ideas, problems and solutions to both an expert and non-expert audience.
- **CB5.** That students have developed the learning skills necessary to undertake subsequent studies with a high degree of autonomy.
- **B05.** Basic knowledge of geology and geomorphology and its application to engineering problems. Climatology.

General skills:

- **G1.** Comprehension and mastery of fundamental knowledge in the area of study and the ability to apply this fundamental knowledge to specific tasks of an environmental professional
- **G2.** Communication and argumentation, oral and written, of stances and conclusions, to expert audiences or broadcasting and information to non-expert audiences
- **G3.** Capacity to solve problems, both generic ones and ones typical of the area, using the interpretation and analysis of relevant data and evidence, the issuing of evaluations, decisions, reflections and pertinent diagnoses, with the consideration suitable to scientific, ethical or social aspects
- **G4.** Capacity of consistent decision-making**.**
- **G5.** Capacity of critical reasoning (analysis, synthesis and assessment).
- **G6.** Capacity to apply theoretical knowledge to an analysis of situations.
- **G7.** Mastery of IT applications related to the field of study, as well as the use of the internet as medium and source of information.
- **G8.** Capacity to autonomously organize and plan work and manage information.
- **G9.** Capacity to work on a team, in particular tams of an interdisciplinary and international nature typical of the work in this field.
- **G10.** Capacity to lead, to organize working teams and fundamental skills in interpersonal relationships
- **G11.** Capacity of communication, argumentation and negotiation both with specialists of the area as well as non-experts on the subject.
- **G12.** Ethnical commitment to all aspects of one?s professional performance
- **G13.** Capacity of autonomous learning and self-assessment
- **G14.** Creativity, initiative and enterprising spirit
- **G15.** Capacity to adapt to new situations
- **G16.** Motivated by quality
- **G17.** Sensitivity towards environmental themes
- **G23.** Competences to know and understand respect for fundamental rights, equal opportunities between women and men, universal accessibility for people with disabilities, and respect for the values ??of the culture of peace and democratic values
- **G24.** Competences to promote entrepreneurship
- **G25.** Knowledge of information and communication technologies (ICT)

Specific skills:

- **C05.** Knowledge of geotechnics and mechanics of soils and rocks, as well as its application in the development of studies, projects, constructions and operations where it is necessary to carry out earthworks, foundations and containment structures

2.2. Learning goals

The student, to pass this subject, must demonstrate the following results in order to:

- Know how to plan a campaign of geotechnical prospecting of the soil, facing the execution of a civil work
- Understand the behavior of different types of substrates in their interaction with different civil works
- Know how to assess the suitability of different types of materials for use in civil works, both in the case of rocks (for aggregates) and soils
- Properly pose and solve problems related to both transmission of stresses in the subsoil and response of the subsoil facing the application of loads transmitted by civil works
- Critically analyze geotechnical problems from technical, geological and safety perspectives
- Manage the methodological procedures aimed at the physical characterization of soils, often used in Civil Engineering

2.3. Importance of learning goals

These learning results will provide the student with a detailed view of the behavior of the substrates on which civil works will be supported, but will also familiarize them with the most common field and laboratory methodologies in this discipline.

In addition, the autonomous part of learning will influence the development of the student's ability to identify problems and develop strategies for their resolution.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Following the spirit of the Bologna Treaty, regarding the degree of involvement and continued work of the student throughout the course, the evaluation of the subject considers the continuous evaluation system as the most consistent to be in line with the guidelines set by the new framework of the EHEA

The **continuous evaluation system** will have the following group of qualifying activities:

- **1.- Continuous assessment exercices:** The student must carry out 5 continuous assessment exercises, which will be distributed throughout the course, according to the planning table. Each exercise will be delivered to the student after completing the theory topics and corresponding exercises in class. The student will have a week to do it and deliver it to the teacher, since this activity is continuous and should not be delayed in time. These exercises will be similar to those carried out in class, and for its resolution the student will also have the assistance of the teacher during tutoring hours, to clarify any doubts about it. This activity will contribute globally with 30% to the final grade for the course (that is, each exercise represents 5% of the final grade), and to take this grade into account, all exercises must be submitted.
- **2.- Continuous assessment tests:** The student will take a total of two compulsory written tests in the continuous assessment system, which will be distributed throughout the course, one halfway through and the other at the end of the semester. These tests will collect theoretical questions and exercises on the corresponding topics. This activity will globally contribute with 70% to the final grade for the course.

To opt for the continuous assessment system, the student must attend at least 80% of the class activities, including practicals and technical visits.

The evaluation criteria to be followed for the activities of the continuous evaluation system are:

- Exercises: Its presentation and correct development, the writing and coherence of what was discussed, as well as the achievement of results and the final conclusions obtained will be valued. The score will range from 0 to 10 points.
- Tests: They will consist of a written exam scored from 0 to 10. The final grade will be calculated as the arithmetic average of the two tests, as long as there is no unit grade below 4.0 points, in this case the activity will be suspended. The approach and the correct resolution will be valued, as well as the justification of the methodology used when solving the exercises.

In case of not passing in this way, the student will have two calls to do so, but this time under the modality of global assessment test. In addition, the student who has passed the subject through this dynamic, may also choose the final evaluation, on first call, to increase grade but never to lower.

Final assessment global test

The student will be able to opt for this modality when, due to his personal and reasonably justifiable situation, he cannot adapt to the rhythm of work required in the continuous evaluation system, or when he has suspended or wants to upload a grade having participated in this last evaluation methodology. As in the continuous assessment methodology, the global final assessment test aims to check if the learning results have been achieved, as well as contributing to the acquisition of the various skills.

The global final evaluation test in both calls will include the following qualifying activity:

- **Written test:** Due to the type of subject, the most appropriate type of test consists of solving exercises of theoretical and/or practical application with similar characteristics to those solved during the conventional development of the subject, together with the answer to brief theoretical questions.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of

teaching and learning tasks are implemented, such as lectures, practice sessions, laboratory sessions, and individual tutorials.

A strong interaction between the teacher/student is promoted. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

The current course (Geotechnics) is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each topic, the problem-solving/resolution of questions and laboratory work.

If due to health reasons the in-person teaching-learning process is not possible, it shall be carried out telematically.

4.2. Learning tasks

This course is organized as follows:

- **Lectures**: The theoretical concepts of the course are explained and illustrative examples are developed as a support to the theory when necessary. It involves the active participation of the student.
- **Practice sessions**: Problems and practical cases are carried out, complementary to the theoretical concepts studied.
- **Laboratory sessions.** The lecture group is divided up into various groups, according to the number of registered students, but never with more than 20 students, in order to make up smaller sized groups.
- **Tutorials**: Those carried out giving individual, personalized attention with a teacher from the department. These tutorials may be on-site or online.
- **Autonomous work and study**:
    - Study and understanding of the theory taught in the lectures.
    - Understanding and assimilation of the problems and practical cases solved in the practice sessions.
    - Preparation of seminars, solutions to proposed problems, etc.
    - Preparation of the written tests for continuous assessment and final exams.

4.3. Syllabus

This course will address the following topics:

INTRODUCTION (1 WEEK)

- 1.- GEOTECHNICS AND CIVIL ENGINEERING
- 2.- GEOTECHNICAL CLASSIFICATION OF SOILS AND ROCKS

SOIL MECHANICS (10 WEEKS)

- 3.- BASIC PROPERTIES OF SOILS
- 4.- STRENGTH OF NATURAL SOILS
- 5.- NATURAL TENSIONS IN SOILS
- 6.- DEFORMABILITY OF SOILS
- 7.- SPECIAL SOILS AND REUSING OF SOILS IN CIVIL WORKS

ROCK MECHANICS (1 WEEK)

- 8.- GEOMECHANICS OF ROCK MASSES

GEOTECHNICAL SURVEY OF GROUND (1 WEEK)

- 9.-GEOTECHNICAL PROPECTIONS IN THE FIELD

BEARING CAPACITY OF FOUNDATIONS (2 SEMANAS)

- 10.- INTRODUCTION TO FOUNDATIONS FROM A GEOTECHNICAL POINT OF VIEW. SELECTION CRITERIA OF FOUNDATIONS. THE GEOTECHNICAL REPORT.

4.4. Course planning and calendar

This course has 6 ECTS credits, which represents 150 hours of student work in the course during the term, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These figures are obtained from the course file in the Accreditation Report of the degree, taking into account the level of experimentation considered for this course is moderate.

Activity	Weekly hours

Lectures	4
Other Activities	6

Nevertheless, the previous table can be shown in greater detail, taking into account the following overall distribution:
? 46 hours of lectures, with 50% theoretical demonstration and 50% solving type problems.
? 6 hours of laboratory work.
? 4 hours of written assessment tests, two hours per test.
? 90 hours of personal study, divided up over the 15 weeks of the 2nd semester.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28718