Universidad Zaragoza

**Academic Year/course: 2021/22**

# 28704 - Geological engineering

## Syllabus Information

**Academic Year:** 2021/22
**Subject:** 28704 - Geological engineering
**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia
**Degree:** 423 - Bachelor's Degree in Civil Engineering
**ECTS:** 6.0
**Year:** 1
**Semester:** First semester
**Subject Type:** Basic Education
**Module:**

## 1. General information

### 1.1. Aims of the course

The course and its expected results respond to the following aims:

The main objective of the subject is to get students to acquire the basic knowledge of geology and morphology of the terrain and its application in problems related to Engineering, as it is included in the compulsory competency of Basic Training B.05 of the Report of Degree in Civil Engineering.To achieve this main objective, we will pursue the achievement of a series of specific objectives, which are explained below:

-Knowledge of the different types of geological materials, mainly rocks, of which the student must know how to classify, describe and know their mineralogical and chemical characteristics.

- Basic knowledge and main properties of natural materials, according to their technical characteristics: soils and rocks.

- Acquisition of basic knowledge about hydrology, hydrogeology and climatology, very important in Civil Engineering and that will be developed in detail in subjects of the following courses of the degree with an intensity that will depend on the educational path chosen by the student.

- Familiarization with the main natural risks related to geology, as well as its affection to civil engineering works.

### 1.2. Context and importance of this course in the degree

This course is carried out in the first year of the degree since it involves the delivery of basic geology contents, necessary to be able to tackle other applied subjects that are found in the following courses, mainly the so-called "Geotechnics".
Other aspects that are presented and worked on in this subject constitute the starting point for the development of other courses. Among these aspects are the issues related to hydrology, both superficial and underground, and to the techniques of cartographic representation.

### 1.3. Recommendations to take this course

In this course the most important geological aspects of application to various fields of civil engineering are presented, from an eminently basic level, so there are no specific recommendations to take this course.

## 2. Learning goals

### 2.1. Competences

**Students are guaranteed to gain at least the following basic and general 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
- **G18.** Capacity to read and correctly communicate in a foreign language
- **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)

## 2.2. Learning goals

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

- A minimal basic knowledge about the different types of rocks existing in the Earth's crust, as well as their main compositional and genetic characteristics as well as identification methodologies.
- Knowing how to perform calculations on topographic maps at different scales of representation.
- Knowing how to prepare profiles from flat topographic representations, as well as solving topographical questions related to civil engineering, both graphically and numerically.
- Knowing how to relate the main geological risks to the natural phenomena that cause them (including basic

knowledge of climatology), as well as reasoning and working on the main minimization and repair strategies.
- Correctly handling the most common terms related to soils and rocks, both in the field of Geology and Geotechnics.
- To be able to infer, from the properties of the main types of rocks, their possible uses in Civil Engineering

### 2.3. Importance of learning goals

The acquisition of contents and the practice in the management of geology tools offered in this subject results in the comprehensive training of the student. On the one hand, it faces the articulation of theoretical and practical concepts through the use of practical tools; and on the other hand, it offers the possibility for the student to approach, independently, the resolution of standard problems with application in different Civil Engineering fields.

Being a course of basic scientific topics, it also emphasizes the ordering of the concepts and their interrelation, in order to facilitate the student to develop conceptual schemes that facilitate the search for solutions through logical reasoning, rather than based on pure memorization of contents.

## 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 group of qualifying activities:

- **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. This test will contribute 70% to the final grade for the course.

- **Proposed exercise:** The teacher will propose a work to be done individually by the student, being delivered and presented on the date established for this purpose. This activity will contribute 30% to the final grade for the course, and will include the different aspects that are covered in the continuous assessment methodology through the exercises.

# 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, tutorials, and autonomous work and study.

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.

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 support to the theory when necessary.
- **Practice sessions**: Problems and practical cases are carried out, complementary to the theoretical concepts studied.
- **Tutorials**: These are carried out by giving individual, personalized attention with a teacher from the department. They can 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 practical classes.
    - 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:

**SECTION A: BASIC GEOLOGY**

- 1. Introduction to Geology. Introducción a la Geología. Importance of Geology in Civil Engineering.
- 2. Matter and Minerals.
- 3. Igneous Rocks.
- 4. Sedimentary Rocks.
- 5. Metamorphic Rocks.
- 6. Joints
- 7. Introduction to Geological Cartography

**SECTION B: APPLIED GEOLOGY**

- 8. Introduction to Rock Mechanics. Use of rocks in Civil Engineering.
- 9. Surface and Ground Hidrology. Climatology
- 10. Introduction to Soil Mechanics
- 11. Introduction to Natural Risks in Civil Engineering
- 12. Seismic Risk.
- 13. Fluvial processes and Flooding Risk.
- 14. Slope Movements Risk.
- 15. Karstic Subsidence Risk.

## 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:

- 52 hours of lectures, with 50% theoretical demonstration and 50% solving type problems.
- 4 hours of written assessment tests, two hours per test.
- 90 hours of personal study, divided up over the 15 weeks of the 2$^{nd}$ semester.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of EUPLA website and Moodle.

## 4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28704