

## 28756 - Extension of Underground Hydrology

### Syllabus Information

**Academic year:** 2024/25

**Subject:** 28756 - Extension of Underground Hydrology

**Faculty / School:** 175 - Escuela Universitaria Politécnica de La Almunia

**Degree:** 423 - Bachelor's Degree in Civil Engineering

**ECTS:** 6.0

**Year:** 4

**Semester:** Second semester

**Subject type:** Optional

**Module:**

### 1. General information

The subject "Extension of Groundwater Hydrology" includes competences related to water circulation in the subsoil, both in natural regime and in Civil Engineering infrastructures. The planning of the subject interrelates the theoretical concepts with the strategies of graphical and analytical approach and resolution. Work is also being carried out on the different tests in the field and in the laboratory to obtain hydraulic parameters for numerical calculations in different hydrogeological situations in order to model the participation of groundwater in any civil works.

### 2. Learning results

The main learning results pursued with this subject are:

- Identify and characterize geological formations according to their hydrogeological parameters (porosity and permeability)
- Apply hydrogeological investigation and prospecting techniques for the exploitation and management of groundwater resources.
- Interpret the results of pumping tests under different execution conditions.
- Identify the possible hydrogeological problems associated with hydraulic infrastructures, and know how to solve them graphically and analytically.

### 3. Syllabus

#### BLOCK A.- INTRODUCTION

1. INTRODUCTION TO HYDROGEOLOGY. RELATIONSHIP BETWEEN THE SURFACE AND GROUNDWATER HYDROLOGICAL CYCLE

#### BLOCK B.- SUBWAY HYDRAULICS

2.- HYDROGEOLOGICAL PARAMETERS: POROSITY, PERMEABILITY, HYDRAULIC CONDUCTIVITY, TRANSMISSIVITY, TRANSMISSIVITY, DARCY'S LAW

3.- TYPES OF AQUIFERS

4.- SURFACE WATER-GROUNDWATER RELATIONS

5.- PIEZOMETRY: ISOPYCNALS MAPS. HYDROGEOLOGICAL MAPPING

6.- GROUNDWATER HYDROCHEMISTRY

#### BLOCK C.- GROUNDWATER STUDY AND EXPLORATION TECHNIQUES

7.- INTRODUCTION TO SUBSURFACE FLOW MODELING

8.- ANALYTICAL SOLUTIONS. PUMPING TESTS: STEADY AND STATIONARY REGIME 9.- GRAPHICAL SOLUTIONS: FLOW NETWORKS

#### BLOCK D.- GROUNDWATER IN PUBLIC WORKS

10.- GROUNDWATER AND WATERWORKS. AFFECTATION TO WORKS AND EXECUTION OF PUMPING.

11.- GEOTECHNICAL PROBLEMS: SIPHONAGE, MODIFICATION OF THE RESISTANT CHARACTERISTICS OF THE SOIL DUE TO THE PRESENCE OF GROUNDWATER

### 4. Academic activities

The teaching methodology of this subject is based on a series of organized and directed classroom activities, in which the basic concepts will be taught and consolidated through the realization of tutored practices, also of a classroom and directed nature. In addition, in the practical sessions, autonomous activities will be proposed so that the student can approach their resolution in a non-directed way. According to the above, the teaching methodology can be schematized as follows:

**A) Face-to-face activities:** They will be developed at the Center, with the distribution in theory and practice groups according to

the schedule of the degree and with the time dedication that is indicated.

- Theoretical classes: Teaching of the theoretical concepts of the subject (40 hours)
- Tutored practical sessions: Presentation of examples, proposal and resolution of problems in a tutored manner by the professor, in relation to the theoretical concepts taught in the theoretical classes (20 hours).

**B) Non-attendance activities (work)-** Proposal of problems for students to solve independently , with the support of the teacher in tutorials. These activities are an important part of the development autonomous development of students when addressing problems and seeking solutions to them, encouraging critical analysis of the theoretical information provided for its application in each specific practical case. Four activities of this type will be carried out , with a total dedication of 40 hours by the students.

## 5. Assessment system

The proposed assessment system is of a continuous type, for which it will be necessary to attend at least 80% of the face-to-face activities and will have the following scheme of gradable activities:

**1.- Continuous Assessment Exercises.** A total of 4 continuous assessment exercises will be proposed (non face-to-face activities ), which will be distributed throughout the subject once the corresponding theory topics and exercises have been completed.

These exercises will be similar to those carried out in the classroom, and for their resolution the students will have the assistance of the teacher during tutoring hours. This activity will contribute 30% to the final grade of the subject, and all exercises must be handed in.

**2.- Continuous assessment tests:** There will be two mandatory written tests in the system of continuous assessment, which will be distributed throughout the subject, one in the middle and one at the end of the term. These tests will include theoretical-practical questions and problems of the corresponding topics. This activity will contribute globally with 70% to the final grade, and a minimum grade of 4 out of 10 must be obtained in each written test, otherwise the activity will be considered failed.

Prior to the first call, the teacher of the subject will notify each student whether or not they have passed the subject according to the use of the continuous assessment system, based on the sum of the scores obtained in the different activities developed throughout the subject. In case of not passing in this way, the student will have the two calls to do so, but this time in the form of a global evaluation test.

As an alternative to the continuous assessment mode, when due to a personal and reasonably justifiable situation, the student cannot adapt to the pace of work required in the continuous assessment system, the student may use the **global assessment system**, which will be resolved by means of an evaluation test on the dates of the two official exams, in which the student will have to answer the theoretical and practical questions related to the different activities developed in the subject.

## 6. Sustainable Development Goals

- 5 - Gender Equality
- 6 - Clean Water and Sanitation