

25246 - Environmental Hydrogeology

Información del Plan Docente

Academic Year	2016/17
Academic center	201 - Escuela Politécnica Superior
Degree	277 - Degree in Environmental Sciences
ECTS	6.0
Course	
Period	Four-month period
Subject Type	Optional
Module	---

1. Basic info

1.1. Recommendations to take this course

1.2. Activities and key dates for the course

2. Initiation

2.1. Learning outcomes that define the subject

2.2. Introduction

3. Context and competences

3.1. Goals

3.2. Context and meaning of the subject in the degree

3.3. Competences

3.4. Importance of learning outcomes

4. Evaluation

5. Activities and resources

5.1. General methodological presentation

The learning process designed for this course is based on:

- Theoretical sessions, which will consist in face-to-face master classes.
- Practical activities, which will include watching videos, solving problems, field trips and laboratory sessions at the Agricultural and Forestry Engineering lab facilities.

5.2. Learning activities

The programme offered to the student in order to help him/her attain the expected goals comprises the following

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activities:

- *Theoretical sessions* . Face-to-face classes in which the contents of the different lessons will be covered. This activity is scheduled to take 20 hours throughout the semester.
- *Problem-solving sessions*. Face-to-face classes in which the contents covered in the master classes will be further developed in a practical way. This activity will also require 20 hours.
- *Practical work*. 20 hours.
- *Office-hours*. The timetable is available [here](#) .

5.3.Program

Theoretical contents:

- BLOCK I: GENERAL GEOLOGY
 - o Topic 1.1. Review of basic geological concepts.
- BLOCK II: BASIC PRINCIPLES OF HYDROGEOLOGY.
 - o Topic 2.1. Porosity and hydraulic conductivity.
 - o Topic 2.2. Energy and Darcy's Law.
 - o Topic 2.3. Types of aquifers. Examples. Impact of overexploitation. Examples.
 - o Topic 2.3. Piezometers, groundwater contour lines, flow lines and equipotential surfaces.
 - o Topic 2.4. The chemistry of groundwater.
- BLOCK III: ABSTRACTION
 - o Topic 3.1. Analysis of springs.
 - o Topic 3.2. External geophysics.
 - o Topic 3.3. Boring: Drilling, rotation, rotary percussive drilling. Internal geophysics, piping and development. Installation.
 - o Topic 3.4. Well gauging. Pumping tests.
- BLOCK IV: NUMERICAL HYDROGEOLOGY
 - o Topic 4.1. Laplace and Boussinesq formulae.
 - o Topic 4.2. Thiem and Dupuit formulae. Mirrors method.
 - o Topic 4.3. Theis formulae. Pumping with variable flow. Determining S and T using gauges. Application in semi-confined and free aquifers.
- BLOCK V. POLLUTION OF AQUIFERS
 - o Topic 5.1. Types. Examples. Possible solutions.

Practical contents:

- *Problems*
- *Laboratory visits* : Rock identification. Drilling equipment, well construction materials.
- *Field trip* : Measuring h and the hydraulic gradient.

5.4.Planning and scheduling

The student is expected to devote approximately 150 hours to this course, which comprise both face-to-face activities and autonomous work, according to the following breakdown:

- 20 hours for face-to-face theoretical sessions.
- 40 hours for face-to-face practical activities.
- 90 hours of autonomous work.

Face-to-face sessions will be scheduled according to the classes timetable approved by Board of the Higher Technical School of Huesca and which is available at its webpage.

Field trips will be conducted within the Higher Technical School of Huesca grounds, in the timetable scheduled for the course. They will be announced in the classroom, in previous sessions.

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5.5. Bibliography and recommended resources

Basic bibliographical references:

- BB Freeze, R. Allan. Groundwater / R. Allan Freeze, John A. Cherry . Englewood Cliffs, New Jersey : Prentice-Hall, cop. 1979
- BB Fetter, C.W.. Applied hydrogeology / C.W. Fetter . 4th ed. Upper Saddle River, New Jersey : Prentice Hall, cop.2001