

25246 - Environmental Hydrogeology

Información del Plan Docente

Academic Year	2018/19
Subject	25246 - Environmental Hydrogeology
Faculty / School	201 - Escuela Politécnica Superior
Degree	277 - Degree in Environmental Sciences
ECTS	6.0
Year	
Semester	Four-month period
Subject Type	Optional
Module	---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

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, problem-solving, fieldwork and laboratory sessions.

4.2.Learning tasks

This course is organized as follows:

- **Lectures** (20 hours). Face-to-face classes in which the contents of the different lessons will be covered.

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- **Problem-solving sessions** (20 hours). Face-to-face sessions in which the contents covered in the lectures will be further developed in a practical way.
- **Practice sessions** (20 hours). Videos, fieldwork, laboratory sessions at the Agricultural and Forestry Engineering lab facilities.
- **Tutorials.**

4.3.Syllabus

This course will address the following topics:

Lectures

- **Section I: General geology**
 - o Topic 1.1. Review of basic geological concepts.
- **Section 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.
- **Section 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.
- **Section 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.
- **Section 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.

4.4.Course planning and calendar

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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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 Sciences website and Moodle.

4.5. Bibliography and recommended resources

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

The updated recommended bibliography can be consulted in:

<http://psfunizar7.unizar.es/br13/egAsignaturas.php?id=2209>