

## 26410 - Hydrogeology

### Syllabus Information

**Academic Year:** 2019/20

**Subject:** 26410 - Hydrogeology

**Faculty / School:** 100 -

**Degree:** 296 - Degree in Geology

588 - Degree in Geology

**ECTS:** 7.0

**Year:** 588 - Degree in Geology: 2

296 - Degree in Geology: 2

**Semester:** Second semester

**Subject Type:** Compulsory

**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, problem-solving sessions, field trips and autonomous work and study.

#### 4.2.Learning tasks

This course is organized as follows:

- **Lectures** (32 hours). In addition to the lectures, where the main topics will be developed, practice sessions contribute to strengthen, extend, and apply previous concepts.
- **Problem-solving sessions** (30 hours).
- **Fieldwork** (2 trips, 8 hours).
- **Autonomous work and study** (105 hours).

### 4.3.Syllabus

This course will address the following topics:

- Topic 0. Introduction to hydrogeology
- Topic 1. The hydrologic cycle
- Topic 2. Porous media: porosity and permeability
- Topic 3. Aquifers, aquitards and aquicludes
- Topic 4. Storage parameter
- Topic 5. Fluid Energy: the Bernoulli equation
- Topic 6. Hydraulic head and hydraulic potential
- Topic 7. Darcy's Law
- Topic 8. Equations of Groundwater flow
- Topic 9. Streamlines and flow nets
- Topic 10. Analytical solution of one and two-dimensional groundwater flow problems
- Topic 11. Groundwater modelling
- Topic 12. Groundwater flow patterns: Models of Hubbert and Toth
- Topic 13. Groundwater investigation techniques
- Topic 14. Water wells: design and construction
- Topic 15. Drilling techniques
- Topic 16. Well hydraulics: Thiem, Theis and Jacob equations
- Topic 17. Groundwater in various geologic settings
- Topic 18. Groundwater interaction with stream and lakes
- Topic 19. Recharge and infiltration estimation
- Topic 20. Groundwater discharge: springs and wetlands.
- Topic 21. Heat transport and groundwater flow
- Topic 22. Chemical hydrogeology
- Topic 23. Groundwater quality and contaminant hydrogeology

### 4.4.Course planning and calendar

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 and Earth Sciences Department websites (<https://ciencias.unizar.es>; <https://cienciatierra.unizar.es>) and Moodle.

### 4.5.Bibliography and recommended resources

[http://biblos.unizar.es/br/br\\_citas.php?codigo=26410&year=2019](http://biblos.unizar.es/br/br_citas.php?codigo=26410&year=2019)