

## SUBJECT TEACHING GUIDE

### 1125 - Hydrology and Hydrogeology

#### Master's Degree in mining engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Master's Degree in mining engineering			Type and Year	Optional. Year 2
Faculty	School of Mines and Energy Engineering				
Discipline	BLOCK I, SPECIALTY EXPLOITATION OF MINES Optional Module				
Course unit title and code	1125 - Hydrology and Hydrogeology				
Number of ECTS credits allocated	3	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. CIENCIAS DE LA TIERRA Y FISICA DE LA MATERIA CONDENSADA				
Name of lecturer	JUAN REMONDO TEJERINA				
E-mail	juan.remondo@unican.es				
Office	Facultad de Ciencias. Planta: + 2. DESPACHO PROFESORES (2018)				
Other lecturers	PABLO VALENZUELA MENDIZABAL				

### 3.1 LEARNING OUTCOMES

- To know the basics of Hydrology and Hydrogeology.

### 4. OBJECTIVES

Students need to be familiar with surface and ground waters, as well as with the environmental impacts caused by mining activity on water.

## 6. COURSE ORGANIZATION

CONTENTS	
1	<p><b>SURFACE WATER</b></p> <p>1.- Introduction. The hydrologic cycle. Volume of flow.</p> <p>2.- Drainage basins. Types of basins. The hydrologic equation: precipitation, evapotranspiration and infiltration.</p> <p>3.- Equations for surface water flow. Hyetographs and stream hydrographs. Measurements of stream flow, stream gauging.</p>
2	<p><b>GROUND-WATER</b></p> <p>4.- Ground-water resources: aquifers, types. Ground-water development.</p> <p>5.- Ground-water flow. Water flow equation in porous medium: Darcy's Law. Force potential and hydraulic head. Piezometry.</p> <p>6.- Ground-water investigation and characterization. Geophysical methods applied to hydrogeology. Ground-water modelling (software).</p> <p>7.- Computing drawdown caused by pumping well. Determining aquifer parameters from time drawdown data, permeability. Slug tests.</p> <p>8.- Hydrochemistry. Ground-water contamination.</p> <p>9.- Mineral and thermal water.</p>
3	<p><b>HYDROGEOLOGY APPLIED TO MINING</b></p> <p>10.- Water issues related to mining activity. Mining activity and water contamination.</p> <p>11.- Characterization and restoration of mine and tailing leachate waters. Prevention and restoration methods for acid waters from mines. Abandoned mines and environmental impact on waters.</p>

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Laboratory practical work Laboratory report evaluation	Laboratory evaluation	No	Yes	20,00
Course work report and presentation Report and presentation evaluation	Work	No	Yes	20,00
Final exam (technical/practical)	Written exam	Yes	Yes	60,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
If a student does not obtain the minimum score required to pass an evaluation test, the final mark will be the lowest value between 4.9 and the weighted average of all the evaluation tests.				
<b>Observations for part-time students</b>				
For partial enrollment students, laboratory practical work is obligatory. Laboratory and course work reports are also compulsory.				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

- Custodio, E. y Llamas, R.M. (Eds.)(1996). Hidrología Subterránea. (2ª ed.). Omega, Barcelona, 2308 p.
- Fetter, C.W. (1994). Applied Hydrogeology. (3rd Ed.). Prentice-Hall, New Jersey, 691 p.
- Martínez Alfaro, P., Martínez Santos, P. y Castaño, S. (2006). Fundamentos de hidrogeología. Mundi-Prensa Libros, Madrid.
- Villanueva, M. e Iglesias, A. (1984). Pozos y acuíferos. Técnicas de evaluación mediante ensayos de bombeo. IGME, 426 p.

