

## SUBJECT TEACHING GUIDE

### 1116 - Design and implementation of underground works

Master's Degree in mining engineering  
Master's Degree in mining engineering

Academic year 2025-2026

1. IDENTIFYING DATA					
Degree	Master's Degree in mining engineering Master's Degree in mining engineering			Type and Year	Compulsory. Year 1 Compulsory. Year 1
Faculty	School of Mines and Energy Engineering				
Discipline	MINING				
Course unit title and code	1116 - Design and implementation of underground works				
Number of ECTS credits allocated	3	Term	Semester based (1)		
Knowledge Field	Architecture, construction, building and urban planning, civil engineering Architecture, construction, building and urban planning, civil engineering				
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. TRANSPORTES Y TECNOLOGIA DE PROYECTOS Y PROCESOS				
Name of lecturer	RUBEN PEREZ ALVAREZ				
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Other lecturers					

#### 4. OBJECTIVES

The objectives of this subject are knowing the project, design, construction and execution of tunnels and underground works.

6. SUBJECT PROGRAM	
CONTENTS	
1	UNDERGROUND WORKS.
2	INVESTIGATION OF ROCK MASS.
3	GEOMECHANIC CLASSIFICATIONS.
4	CLASSIFICATION OF TERRAIN ACCORDING TO ITS EXCAVABILITY.
5	EXECUTION PROJECT OF A TUNNEL.
6	TUNNEL MOUTHS.
7	MECHANICAL EXCAVATION OF TUNNELS.
8	TUNNEL BORING MACHINES.
9	TUNELLING BY DRILL AND BLAST METHODS.
10	TUNELLING METHODS.
11	SUPPORT OF TUNNELS.
12	TUNNEL VENTILATION.
13	OTHER UNDERGROUND WORKS.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
FINAL EXAM - Written Exam.	Written exam	Yes	Yes	60,00
Essay - Essay evaluation (Group).	Work	No	Yes	25,00
PRACTICES - Practical Evaluation - Resolution of practical cases.	Others	No	Yes	15,00
TOTAL				100,00
Observations				
In order to pass, the student will be required to obtain a minimum score of 4.0/10 in the Final Exam of Contents, and an average score of 5/10 in the whole subject. If this requirements is not satisfied, the final score will be obtained as the weighted average of the different items of evaluation, until a maximum of 4.9. Any passed item would be kept for the extraordinary evaluation.				
Observations for part-time students				
Part-time students will be evaluated according to the Normative of University of Cantabria. Part-time students will be evaluated following the Normative of University of Cantabria. In addition to the requirement of passing the Final Exam of Contents, and given the characteristics of the activities proposed for the continuous evaluation, part time students will be subject to them as the rest of students.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Manual de voladuras en túneles. López Jimeno, C., López Jimeno, E. y García Bermúdez, P. Madrid: U.D. Proyectos-ETSIIM (UPM). 2010.
Manual de Túneles y obras subterráneas. Editor: Carlos López Jimeno Colección IngeoTúneles. López Jimeno, C. Madrid: Varias Editoriales.
Excavación mecánica de túneles. Cornejo Álvarez, L. Rueda. 1988.
Apuntes facilitados por el Profesor.

