



## Teaching Guide

Teaching Guide				
Identifying Data				2024/25
Subject (*)	Underground Constructions and Tunnels		Code	632514030
Study programme	Mestrado Universitario en Enxeñaría de Camiños, Canais e Portos			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	4.5
Language	Galician			
Teaching method	Hybrid			
Prerequisites				
Department	Enxeñaría Civil			
Coordinador	Alcón Vidal, Vicente Álvaro		E-mail	vicente.alcon@udc.es
Lecturers	Alcón Vidal, Vicente Álvaro		E-mail	vicente.alcon@udc.es
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Web	ftp://ceres.udc.es/Asignaturas			
General description	The main aspects of: the history of the tunnels, the tunnel project, the tunnels in soils and soft rocks, the tunnels in hard rocks, the construction methods of caves, the hydrology in the tunnels, the numerical modeling of underground works are presented. and some recent examples of underground works			

## Study programme competences / results

Code	Study programme competences / results
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## Learning outcomes

Learning outcomes	Study programme competences / results		
Assimilate the fundamental concepts of tunnels and underground works			
Assimilate the fundamental concepts of tunnels and underground works			
Train for the tunnel project			
Train for the tunnel project			
Know the methods to evaluate the effects of the works on the ground and the hydrology of the subsoil			
Know the methods to evaluate the effects of the works on the ground and the hydrology of the subsoil			
Know and select the construction methods of tunnels and underground works			
Know and select the construction methods of tunnels and underground works			

## Contents

Topic	Sub-topic
Introduction and Generalities	Reason for underground works
	History and technological evolution
	Functional determining factors of the design



Geological-geotechnical characterization of tunnels	<p>Geological-geotechnical risks</p> <p>Geological-geotechnical survey</p> <p>Geomechanical classifications</p>
Models of tunnel behavior	<p>Design criteria and factors</p> <p>Design methods</p> <p>Models of mechanical behavior</p> <p>Models of hydrogeological behavior of tunnels</p> <p>Subsidence study and geotechnical auscultation</p>
Execution methods	<p>Selection criteria</p> <p>Traditional</p> <p>NMAT</p> <p>Tunnel boring machines</p>
Other underground works	<p>Microtunnels</p> <p>Shafts</p> <p>directed drilling</p>

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Guest lecture / keynote speech		20	10	30
Supervised projects		14	28	42
Case study		6	0	6
Field trip		6.5	0	6.5
Problem solving		13	10	23
Personalized attention		5	0	5
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	The different teachers of the subject will present in a maxistrat session the different topics of the subject. Oral presentation complemented with the use of audiovisual media and the introduction of some questions addressed to the students, in order to transmit knowledge and facilitate learning.
Supervised projects	<p>On a piece of land and for a specific work, propose and develop the methodological process to design the tunnel</p> <ul style="list-style-type: none"> <li>- Geotechnical reconnaissance</li> <li>- Study of alternatives</li> <li>- Design and calculation alternative chosen</li> </ul> <p>GROUP WORK</p>
Case study	Analysis of real cases from the educational perspective of the student, facilitating the understanding of the development of the case and its critical assessment from the technical, economic and social point of view.
Field trip	Underground works in progress will be used to check ie the execution methods as well as the organizational operating systems. (Access tunnels to the outer port of Coruña and Ferrol.)



Problem solving	The different teachers of the subject will collaboratively carry out practical exercises in applying theoretical knowledge to strengthen their assimilation.
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Personalized attention	
Methodologies	Description
Supervised projects Guest lecture / keynote speech Problem solving	For the development of the works and the understanding of the concepts, personalized attention will be developed, presence or on-line with the students without limit.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Supervised projects		Make and present the supervised work in the classroom. Answer, after the presentation, questions about it from the students and teachers of the subject.	35
Case study		Study and evaluation of the information Retrospective analysis Study of alternatives in initial situation	15
Guest lecture / keynote speech		Attendance and participation in classes and possible conferences.	25
Problem solving		Review with the teachers of the subject the resolution of the proposed problems.	25

Assessment comments

Sources of information	
Basic	<ul style="list-style-type: none"><li>- (). <a href="http://www.ita-aites.org">www.ita-aites.org</a>.</li><li>- E.Hoek, and E.T. Brown (). Underground Excavations in Rock.</li><li>- C. López Jimeno (). Ingeotúneles. Tomo I ?y otros. Entorno gráfico</li><li>- C. López Jimeno. (). Manual de túneles y obras subterráneas? tomos I y II. Entorno gráfico</li><li>- L I. González Vallejo ,..., Carlo Oteo, (). Ingenieria Geológica .. Pearsón</li><li>- Jimenez Salas y otros (1980). Geotecnia y Cimientos III. Rueda</li><li>- (). <a href="http://www.aetos.es">www.aetos.es</a>.</li></ul>
Complementary	- M.Melis (). ?Apuntes de introducción al Proyecto y Construcción de Túneles y Metros en suelos y rocas blandas o muy rotas.

Recommendations
Subjects that it is recommended to have taken before
Extension in Soil Engineering/632514013
Subjects that are recommended to be taken simultaneously
Rock Mechanics/632514033 Advanced Foundation Solutions/632514032
Subjects that continue the syllabus
Other comments



(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.