



## Teaching Guide

Teaching Guide				
Identifying Data				2021/22
Subject (*)	Camións	Code	632G02033	
Study programme	Grao en Tecnoloxía da Enxeñaría Civil			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Third	Obligatory	6
Language	English			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Civil			
Coordinador	Rodríguez Pasandín, Ana María	E-mail	ana.rodriguez.pasandin@udc.es	
Lecturers	Martinez Bustelo, Carlos Orosa Iglesias, Pablo Rodríguez Pasandín, Ana María	E-mail	carlos.martinez@udc.es p.rosa@udc.es ana.rodriguez.pasandin@udc.es	
Web				
General description	<p>In this subject will be taught the basic concepts that allow to know the problematic of the design and construction of the different elements of a highway.</p> <p>The teaching guide is available in English, Spanish and Galician. In case of discrepancy, the information indicated in the Spanish version shall prevail.</p>			
Contingency plan	<p>1. Modifications to the contents</p> <ul style="list-style-type: none"> <li>- No changes will be made</li> </ul> <p>2. Methodologies</p> <p>*Teaching methodologies that will be maintained</p> <ul style="list-style-type: none"> <li>- Initial activities</li> <li>- Lecture session</li> <li>- Problem solving</li> <li>- Tutored work</li> <li>- Oral presentation</li> <li>- Objective test</li> </ul> <p>*Teaching methodologies to be modified</p> <ul style="list-style-type: none"> <li>- Laboratory practices. Instead of the laboratory practices, audiovisual material will be included in the Moodle where some of the most important laboratory tests can be seen.</li> <li>- Lecture sessions, problem solving, oral presentation and objective test are maintained, but instead of being done in person, they will be done via Teams and/or via Moodle.</li> </ul> <p>3. Mechanisms for personalized attention to students</p> <ul style="list-style-type: none"> <li>- The e-mail will be consulted daily during working hours.</li> <li>- Students will be able to request (via e-mail), meetings via Teams, during working hours, when needed.</li> <li>- Messages will be sent via Moodle when deemed appropriate.</li> </ul> <p>4. Modifications in the evaluation</p> <ul style="list-style-type: none"> <li>- There are no changes in the evaluation conditions.</li> </ul> <p>*Evaluation comments:</p> <ul style="list-style-type: none"> <li>- As commented above, those evaluable activities that cannot be carried out face-to-face, will be carried out non-face-to-face (via Teams and/or Moodle).</li> </ul> <p>5. Modifications of the bibliography or webgraphy</p> <ul style="list-style-type: none"> <li>- Only those bibliographic references that are available in Moodle, such as the slides of the course, the standard 6.1-IC, the standard 3.1-IC and the PG-3, will be taken into account.</li> </ul>			



Code	Study programme competences / results
A27	Conocimiento de la problemática de diseño, cálculo, proyecto y construcción de los distintos elementos de una carretera: trazado, sección transversal, explanaciones, firmes, intersecciones, enlaces, análisis de su capacidad.
A28	Conocimientos de los métodos de conservación y explotación de carreteras y aeropuertos.
A30	Capacidad para entender y analizar la influencia de las infraestructuras de transporte en los procesos territoriales.
B1	Que los estudiantes hayan demostrado poseer y comprender conocimientos en un área de estudio que parte de la base de la educación secundaria general, y se suele encontrar a un nivel que, si bien se apoya en libros de texto avanzados, incluye también algunos aspectos que implican conocimientos procedentes de la vanguardia de su campo de estudio
B2	Que los estudiantes sepan aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posean las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio
B3	Que los estudiantes tengan la capacidad de reunir e interpretar datos relevantes (normalmente dentro de su área de estudio) para emitir juicios que incluyan una reflexión sobre temas relevantes de índole social, científica o ética
B4	Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado
B5	Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía
B6	Resolver problemas de forma efectiva.
B7	Aplicar un pensamiento crítico, lógico y creativo.
B8	Trabajar de forma colaborativa.
B9	Comportarse con ética y responsabilidad social como ciudadano y como profesional.
B10	Comunicarse de manera efectiva en un entorno de trabajo.
B11	Entender y aplicar el marco legal de la disciplina.
B12	Comprensión de la necesidad de actuar de forma enriquecedora sobre el medio ambiente contribuyendo al desarrollo sostenible.
B13	Comprensión de la necesidad de analizar la historia para entender el presente.
B14	Capacidad para organizar y dirigir equipos de trabajo así como de integrarse en equipos multidisciplinares.
B15	Claridad en la formulación de hipótesis.
B16	Capacidad de autoaprendizaje mediante la inquietud por buscar y adquirir nuevos conocimientos, potenciando el uso de las nuevas tecnologías de la información y así poder enfrentarse adecuadamente a situaciones nuevas.
B17	Capacidad para aumentar la calidad en el diseño gráfico de las presentaciones de trabajos.
B18	Capacidad para aplicar conocimientos básicos en el aprendizaje de conocimientos tecnológicos y en su puesta en práctica.
B19	Capacidad de realizar pruebas, ensayos y experimentos, analizando, sintetizando e interpretando los resultados.
C1	Expresarse correctamente, tanto de forma oral como por escrito, en las lenguas oficiales de la comunidad autónoma.
C2	Dominar la expresión y la comprensión de forma oral e escrita de un idioma extranjero.
C3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de la vida.
C4	Desarrollarse para el ejercicio de una ciudadanía abierta, culta, crítica, comprometida, democrática y solidaria, capaz de analizar la realidad, diagnosticar problemas, formular e implantar soluciones basadas en el conocimiento y orientadas al bien común.
C5	Entender la importancia de la cultura emprendedora y conocer los medios al alcance de las personas emprendedoras.
C6	Valorar críticamente el conocimiento, la tecnología y la información disponible para resolver los problemas con que deben enfrentarse.
C7	Asumir como profesional y ciudadano la importancia del aprendizaje a lo largo de la vida.
C8	Valorar la importancia que tiene la investigación, la innovación y el desarrollo tecnológico en el avance socioeconómico y cultural de la sociedad.

Learning outcomes	
Learning outcomes	Study programme competences / results



It allows the knowledge of roads from the point of view of the project, construction and conservation.	A27	B1	C1
It allows to acquire the basic knowledge of grades.	A28	B2	C2
It allows to know the influence of the traffic in the operation of a highway.	A30	B3	C3
It also allows to acquire the fundamental knowledge about the materials usually used road pavements.		B4	C4
It gives the student basic concepts of the air and road transport system.		B5	C5
		B6	C6
		B7	C7
		B8	C8
		B9	
		B10	
		B11	
		B12	
		B13	
		B14	
		B15	
		B16	
		B17	
		B18	
		B19	

Contents	
Topic	Sub-topic
1. Basic concepts	Definition of road. Types of road (this section includes considerations on autonomous and connected vehicles). Elements of the road. Infrastructure and superstructure (the basic concepts of drainage, signalling, beaconing, safeguarding, etc are introduced in this section)
2. Traffic engineering	Basic traffic characteristics (volume, flow rate, speed and density). Traffic studies. Capacity and level of service (LOS) under uninterrupted flow (according to HCM 2010 updated to 6TH Edition).
3. Road design	Basic design criteria. Horizontal and vertical alignment. General recommendations. Cross sectional elements.
4. Earthworks	Earthworks construction. Load-bearing capacity. Soil stabilization.
5. Road pavements	Pavement structure. Binders. Aggregates. Granular layers. Treated layers for bases and subbases. Surface treatments. Bituminous mixtures. Concrete pavements. Pavement design according to standard 6.1-IC. Surface characteristics. Conservation.
6 y 7. Transport	Introduction. Road transport. Air transport.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Introductory activities	B9 B13 B1 B2 C8	1.5	0	1.5
Guest lecture / keynote speech	A27 A28 A30 B8 B10 B11 B12 B14 B15 B3 B4 B5 B6 B7 B16 B17 B18 B19 C2 C3 C4 C5 C6 C7	31.75	31.75	63.5
Laboratory practice	B8 B9 B10 B11 B12 B14 B15 B2 B3 B7 C8	1	0	1



Problem solving	A28 A27 B11 B15 B1 B2 B3 B4 B6 B7 B17 C1 C2 C3 C7	12	18	30
Supervised projects	A27 A30 B9 B10 B11 B12 B2 B3 B4 B5 B6 B7 B17 C2 C1	0	16	16
Oral presentation	A27 A30 B8 B10 B11 B12 B13 B14 B1 B2 B3 B4 B17 C1 C2 C3 C6 C7 C8	2	6	8
Objective test	B9 B10 B11 B15 B1 B2 B3 B4 B5 B7 C1 C2	4	24	28
Personalized attention		2	0	2

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Introductory activities	An initial session is held to present the course program and the organization of the course, presenting the basic bibliography, the form of evaluation and resolving any doubts that students may have before facing the subject.
Guest lecture / keynote speech	Theoretical sessions in which the main contents of the course are transmitted. During these sessions, student participation is encouraged through the generation of short questions as well as the proposal of practical examples.
Laboratory practice	If the planning of the subject allows it, a visit to the Roads Laboratory will be made, where students will be able to see some of the tests explained theoretically in the classroom.
Problem solving	During the course, sessions are held periodically during which exercises are presented to reinforce the theoretical knowledge explained in the lectures. In these sessions, the exercises are solved and any doubts that may arise during the course are resolved. These sessions serve as a base for the correct development of a series of practices that the student will have to hand in to be evaluated.
Supervised projects	Presentation of different exercises related to the different topics of the course, which will be presented in class and must be delivered to the teachers on the dates indicated throughout the course.
Oral presentation	Throughout the course, short oral presentations (e.g. on Smart Roads) may be given. They can be face-to-face or recorded on video by the students of the subject.
Objective test	A final objective test is given at each opportunity to check the knowledge acquired by the students on the subject matter explained in the lectures and in the problem solving sessions. Likewise, objective tests of continuous evaluation of the various topics explained in class or of the problems explained in class may be carried out throughout the course, with prior notice.

Personalized attention	
Methodologies	Description
Oral presentation Supervised projects Problem solving	Personalized attention is provided to solve individual doubts that any of the students may have about the problems solved or any of the theoretical issues raised in the course. On the other hand, personalized attention is a tool for the support of students during the realization of tutored work, oral presentations, problem solving, etc. that may arise during the course.

Assessment			
Methodologies	Competencies / Results	Description	Qualification



Oral presentation	A27 A30 B8 B10 B11 B12 B13 B14 B1 B2 B3 B4 B17 C1 C2 C3 C6 C7 C8	Carrying out of short oral presentations. The specific topic will be defined throughout the course.	20
Objective test	B9 B10 B11 B15 B1 B2 B3 B4 B5 B7 C1 C2	Probas de avaliación de contidos teóricos e prácticos realizadas ao final da materia e/ou probas de avaliación continua realizadas ao longo do curso.  A proba obxectiva final terá un peso do 40% e será preciso obter unha cualificación mínima de 3.0 puntos na mesma para poder superar a materia.  As probas obxectivas de avaliación continua terán un peso do 10% e non será preciso obter unha cualificación mínima nas mesmas para poder superar a materia.	50
Supervised projects	A27 A30 B9 B10 B11 B12 B2 B3 B4 B5 B6 B7 B17 C2 C1	Resolution of the works proposed to the students throughout the course. Several tutored works could be proposed.	10
Problem solving	A28 A27 B11 B15 B1 B2 B3 B4 B6 B7 B17 C1 C2 C3 C7	Resolution of individualized exercise reports of the topics covered in the course.	20

#### Assessment comments

To determine the final grade of the course, the following elements will be evaluated, weighted according to their corresponding weights:

- Problem solving (20%): during the course, a maximum of 2 exercise reports (on traffic, on layout and/or on pavements) will be proposed. The statements will be particularized for each student. The resolution will be individual. The delivery will be via Moodle on the date and in the form that will be indicated throughout the course.
- Supervised assignments (10%): a maximum of 3 supervised assignments (on cross section elements, on road nodes and/or on layout, dynamic and orientation losses) will be proposed throughout the course. The resolution will be individual. The delivery will be via Moodle on the date and form that will be indicated throughout the course.
- Oral presentation (20%): a maximum of 2 short oral presentations (on some aspect of Smart Roads, on layout and/or on pavement maintenance). They may be given in pairs. The particular topic to be chosen and whether they will be given in person or on video will be indicated during the course. In other words, the details of the oral presentations will be defined during the course. Those students enrolled part-time or who for work and/or health reasons are unable to make the oral presentations in person (in the case that they are in person), will make them on video. It will be necessary to adequately justify that they are in any of the above circumstances.
- Objective test (50%): evaluation of the theoretical and/or practical contents:  
Final objective test (40%): it will be held on the date set in the official calendar and according to the modality indicated in the teaching guide for the subject. In order to pass the subject it will be necessary to obtain a minimum grade of 3.0 points out of 10 in the mentioned test. If this minimum grade is not obtained, the other evaluation elements will not be taken into account. Objective tests of continuous evaluation (10%): there will be a maximum of 2 objective tests of continuous evaluation, with prior notice during the course of the date, form and subject. Regardless of whether the student attends the first opportunity, the second or both, there will be a single date for the delivery and/or completion of the activities included in the "Problem solving", in the "Tutored work" and in the "Oral presentation". Likewise, regardless of the opportunity or opportunities to which each student is submitted, the objective tests of continuous evaluation will have a single date of completion. The grade of each one of them will be kept until the second opportunity of the course and will be taken into account in the final grade both in the first and in the second opportunity.

#### Sources of information



<p><b>Basic</b></p>	<ul style="list-style-type: none"> <li>- Kraemer et al. (2004). Ingeniería de Carreteras. Volumen I. McGraw-Hill</li> <li>- Profesores de la asignatura / profesores da materia (). Transparencias de la asignatura / Transparencias da materia.</li>   <li>- Ministerio de Fomento (). Instrucción de Carreteras. Norma 3.1-IC. Trazado. BOE del 4 de marzo 2016</li> <li>- Kraemer et al. (2004). Ingeniería de Carreteras. Volumen II. McGraw-Hill</li> <li>- Transportation Research Board (). Highway Capacity Manual - 2010 y 6TH Edition. Transportation Research Board</li> <li>- Juan de Oña et al. (2004). Problemas resueltos de drenaje, explicaciones y firmes. Grupo editorial universitario</li> <li>- Marcelino Conesa Lucerga y Alfredo García García (1987). Diseño geométrico de carreteras. Universidad Politécnica de Valencia</li> <li>- Ministerio de Fomento (). Pliego de prescripciones técnicas generales para obras de carreteras y puentes, PG-3. Parte 3ª: Explicaciones, Parte 4ª: Drenaje y Parte 5ª: Firmes.</li> <li>- Ministerio de Fomento (2003). ORDEN FOM/3459/2003, de 28 de noviembre, por la que se aprueba la Norma 6.3-IC «REHABILITACIÓN DE FIRMES», de la Instrucción de Carreteras.. BOE nº 297 de 12/12/2003</li> <li>- Ministerio de Fomento (2003). ORDEN FOM/3460/2003, de 28 de noviembre, por la que se aprueba la Norma 6.1-IC «SECCIONES DE FIRME», de la Instrucción de Carreteras.. BOE nº 297 de 12/12/2003</li> <li>- Juan de Oña et al. (2005). Problemas resueltos de caminos y aeropuertos. Trazado. Grupo editorial universitario</li> </ul>
<p><b>Complementary</b></p>	

## Recommendations

### Subjects that it is recommended to have taken before

Debuxo en enxeñaría civil I/632G02003  
 Física aplicada I/632G02004  
 Física aplicada II/632G02005  
 Xeoloxía aplicada/632G02006  
 Álgebra lineal I/632G02007  
 Álgebra lineal II/632G02008  
 Topografía e cartografía/632G02011  
 Mecánica/632G02014  
 Debuxo en enxeñaría civil II/632G02016  
 Materiais de construción I/632G02009  
 Materiais de construción II/632G02010  
 Xeotecnia I/632G02019  
 Xeotecnia II/632G02020

### Subjects that are recommended to be taken simultaneously

### 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.