



Teaching Guide

Identifying Data					2023/24
Subject (*)	Nanotechnology in Civil Engineering		Code	610G04045	
Study programme	Grao en Nanociencia e Nanotecnoloxía				
Descriptors					
Cycle	Period	Year	Type	Credits	
Graduate	2nd four-month period	Fourth	Optional	4.5	
Language	SpanishGalicianEnglish				
Teaching method	Face-to-face				
Prerequisites					
Department	Enxeñaría Civil				
Coordinador	Herrador Barrios, Manuel F.	E-mail	manuel.herrador@udc.es		
Lecturers	Anton Casado, Arturo Fernandez Ruiz, Jesus Gonzalez Fonteboa, Belen Herrador Barrios, Manuel F.	E-mail	arturo.anton@udc.es jesus.fernandez.ruiz@udc.es belen.gonzalez.fonteboa@udc.es manuel.herrador@udc.es		
Web					
General description	Introduction to the application of nanotechnology in civil engineering. An introduction is provided to the required characteristics of the materials that are used in different fields of civil engineering, the applications in which nanomaterials can be used and how they can contribute to modify the properties of some traditional materials.				

Study programme competences / results

Code	Study programme competences / results
A3	CE3 - Reconocer y analizar problemas físicos, químicos, matemáticos, biológicos en el ámbito de la Nanociencia y Nanotecnología, así como plantear respuestas o trabajos adecuados para su resolución, incluyendo el uso de fuentes bibliográficas.
A5	CE5 - Conocer los rasgos estructurales de los nanomateriales, incluyendo las principales técnicas para su identificación y caracterización
A9	CE9 - Evaluar correctamente los riesgos sanitarios y de impacto ambiental asociados a la Nanociencia y la Nanotecnología.
A10	CE10 - Comprender la legislación en el ámbito del conocimiento y la aplicación de la Nanociencia y Nanotecnología. Aplicar principios éticos en este marco.
B3	CB3 - 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	CB4 - Que los estudiantes puedan transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado
B5	CB5 - Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía
B11	CG6 - Comportarse con ética y responsabilidad social como ciudadano/a y como profesional.
C4	CT4 - Desarrollarse para el ejercicio de una ciudadanía respetuosa con la cultura democrática, los derechos humanos y la perspectiva de género
C8	CT8 - 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		
Ability to discriminate and assess the characteristics required of construction materials and tests necessary for their evaluation	A3 A5	B4 B5	C8



Knowledge of civil engineering fields in which nanomaterials can be applied	A3	B3	C4
	A9	B4	C8
	A10	B11	
Knowledge of the processes used to modify the characteristics of traditional materials through the use of nanotechnology and nanomaterials	A3	B3	C4
	A5	B4	C8
	A9	B11	
	A10		

Contents	
Topic	Sub-topic
Introduction to construction and building materials	
Production and use of nanomaterials in civil engineering applications	
Conventional nanomaterials: amorphous carbon and amorphous silica	
Metallic and nonmetallic oxides	
Nanowires and metallic nanoclusters	
Carbon-based nanomaterials: nanotubes and graphene	
Natural nanomaterials	
Nonstructural nanomaterials	
Legal and ethical aspects	

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A3 A5 A9 A10 C4 C8	18	18	36
Problem solving	A3 A5 B3 B4 B5	5	10	15
Supervised projects	A3 A9 A10 B3 B4 B5 B11 C4 C8	2	37	39
Laboratory practice	A3 A5 A9 B3 B4 B5 B11	10	10	20
Personalized attention		2.5	0	2.5

(*)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	It consists of the presentation of a logically structured topic in order to provide organized information following appropriate criteria with a specific objective. This methodology is fundamentally focused on the oral presentation by the teaching staff of the contents on the subject matter under study.
Problem solving	Problems related to the exposed theoretical approach will be raised. In general, they will be solved in class by the teacher with the participation of the students.
Supervised projects	Design and development of works or projects that can be delivered during or at the end of the teaching of the subject
Laboratory practice	Methodology that enables students to learn effectively through practical activities such as demonstrations, exercises, experiments and investigations.

Personalized attention	
Methodologies	Description



Supervised projects	Personalised attention to address the needs and queries of students related to the subject, providing guidance, support and motivation in the learning process. This personalised attention may be provided in person or in a non-classroom setting via email, the virtual campus or similar means.
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Assessment			
Methodologies	Competencies / Results	Description	Qualification
Supervised projects	A3 A9 A10 B3 B4 B5 B11 C4 C8	Students must develop a project of limited extension, consisting of small investigations, materials design or similar. Topics will be proposed by the students themselves or by the teacher, and must be related to one of the blocks of which the subject consists.	50
Laboratory practice	A3 A5 A9 B3 B4 B5 B11	Presentation of practice report. Laboratory practices are mandatory to obtain a passing grade in the subject.	50

Assessment comments

Sources of information	
Basic	
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

Gender perspective: as stated in the transversal competences of the degree (C4), the development of a critical, open and respectful citizenship with diversity in our society will be encouraged, highlighting the equal rights of students without discrimination for reasons of gender or sexual condition. Inclusive language will be used in the material and in the development of the sessions. Work will be done to identify and modify prejudices and sexist attitudes and the environment will be influenced to modify them and promote values of respect and equality. Green Campus Faculty of Sciences Program: to help achieve a sustainable immediate environment and comply with point 6 of the "Environmental Declaration of the Faculty of Sciences (2020)", the documentary work carried out in this matter will be requested in virtual format and computer support. If done on paper, plastics will not be used, double-sided printing will be done, recycled paper will be used and drafts will be avoided."

(*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.