



Teaching Guide

Teaching Guide				
Identifying Data				2024/25
Subject (*)	Physics: Electricity and Magnetism		Code	610G04007
Study programme	Grao en Nanociencia e Nanotecnoloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	First	Basic training	6
Language	SpanishEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Física e Ciencias da Terra			
Coordinador	Cabeza Gras, Oscar	E-mail	oscar.cabeza@udc.es	
Lecturers	Cabeza Gras, Oscar	E-mail	oscar.cabeza@udc.es	
	Nogueira Lopez, Pedro Fernando		pedro.nogueira@udc.es	
Web				
General description	O obxectivo fundamental da materia é a adquisición de conceptos básicos de electricidade e magnetismo, que faciliten a comprensión das materias de Física ou outras disciplinas que forman parte do plan de estudos.			

Study programme competences / results

Code	Study programme competences / results
A1	CE1 - Comprender los conceptos, principios, teorías y hechos fundamentales relacionados con la Nanociencia y Nanotecnología.
A2	CE2 - Aplicar los conceptos, principios, teorías y hechos fundamentales relacionados con la Nanociencia y Nanotecnología a la resolución de problemas de naturaleza cuantitativa o cualitativa.
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.
B1	CB1 - 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	CB2 - 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
B5	CB5 - Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía
B6	CG1 - Aprender a aprender
B7	CG2 - Resolver problemas de forma efectiva.
B8	CG3 - Aplicar un pensamiento crítico, lógico y creativo.
B9	CG4 - Trabajar de forma autónoma con iniciativa.
B11	CG6 - Comportarse con ética y responsabilidad social como ciudadano/a y como profesional.
C1	CT1 - Expresarse correctamente, tanto de forma oral como escrita, en las lenguas oficiales de la comunidad autónoma
C2	CT2 - Dominar la expresión y la comprensión de forma oral y escrita de un idioma extranjero
C4	CT4 - Desarrollarse para el ejercicio de una ciudadanía respetuosa con la cultura democrática, los derechos humanos y la perspectiva de género
C7	CT7 - Desarrollar la capacidad de trabajar en equipos interdisciplinarios o transdisciplinarios, para ofrecer propuestas que contribuyan a un desarrollo sostenible ambiental, económico, político y social.
C8	CT8 - Valorar la importancia que tiene la investigación, la innovación y el desarrollo tecnológico en el avance socioeconómico y cultural de la sociedad
C9	CT9 - Tener la capacidad de gestionar tiempos y recursos: desarrollar planes, priorizar actividades, identificar las críticas, establecer plazos y cumplirlos

Learning outcomes



Learning outcomes	Study programme competences / results		
Understand the description of physical interactions through fields, for which the notions of scalar and vector fields and the operations they support will be introduced: gradient, circulation and rotational.	A1 A2 A3	B5 B7 B8	
Understand the fundamentals of electrostatics and electrokinetics.	A1 A2 A3	B1 B2 B5 B6 B7 B8 B9	C1 C2 C4 C7 C8 C9
To know the bases of magnetism and the properties of magnetic dipoles	A1 A2 A3	B1 B2 B5 B6 B7 B8 B9 B11	C1 C2 C4 C7 C8 C9
To know the basics of electrodynamics, that is, generation and reception of electromagnetic waves.	A1 A2 A3	B1 B2 B5 B6 B7 B8 B9 B11	C1 C2 C4 C7 C8 C9

Contents	
Topic	Sub-topic
BLOCK 1. Introduction	1.1. Escalar Fields 1.2. Vectorial Fields 1.3. Mathematical operators associated to fields
BLOCK 2. Electrostatic	2.1. Forces, fields and electric potential. 2.2. Methods for calculating the electric field and potential. 2.3. Work and electrical energy. 2.4. Electric dipoles and quadrupoles.
BLOCK 3. Electrokinetic	3.1. Current, resistance, capacity, back electromotive force. 3.2. Kirchhoff's Laws 3.3. Resolution of electrical circuits of direct current.
BLOCK 4. Magnetism	4.1. Magnetostatics. 4.2. Magnetic dipoles. 4.3. Earth's magnetic field.
BLOCK 5. Electromagnetism	5.1. Lorentz's force. 5.2. Electromagnetic induction. 5.3. Alternating and direct current generators.



BLOCK 6. Classical Electrodynamics	6.1. Maxwell's laws. 6.2. Generation of electromagnetic waves. 6.3. Reception of electromagnetic waves.
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Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Guest lecture / keynote speech	A1 A3 B5 B8 B9 B11 C4 C7 C8 C9	32	48	80
Seminar	A1 A2 A3 B1 B2 B7 B8 B9 B11	16	32	48
Supervised projects	A1 A2 A3 B1 B2 B5 B6 B7 B8 B9 B11 C1 C2 C4 C7 C8 C9	0	16	16
Mixed objective/subjective test	A1 A2 A3 B1 B2 B5 B7 B8 B9 B11 C1 C4 C9	4	0	4
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
Guest lecture / keynote speech	Presentation of the concepts and laws associated with the fundamentals of electromagnetism.
Seminar	Application of the concepts presented in the master sessions by solving exercises interactively.
Supervised projects	Completion of two supervised works, one will be addressed individually while the other will consist of developing a series of tasks collaboratively within a group.
Mixed objective/subjective test	Carrying out tests on the theoretical and practical contents of the subject individually.

Personalized attention	
Methodologies	Description
Supervised projects	Personalized attention will consist of monitoring the progress of the work or resolving doubts related to its preparation, and will take place individually or in groups, depending on the nature of the work. All tutorials can be done virtually.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Supervised projects	A1 A2 A3 B1 B2 B5 B6 B7 B8 B9 B11 C1 C2 C4 C7 C8 C9	Two supervised works will be proposed. One will be done individually and the other in a group. Each work will have a weight in the qualification of 20%.	30
Mixed objective/subjective test	A1 A2 A3 B1 B2 B5 B7 B8 B9 B11 C1 C4 C9	Two partial tests will be carried out, each of them contributing a weight in the qualification of 30%.	70

Assessment comments



To pass the subject, students must achieve a minimum of 5 points and, in addition, they must obtain a minimum score of 4.5 points out of 10 in each partial test. The evaluation criteria will be the same in all opportunities. The partials approved are kept both in the 1st and in the 2nd opportunity.

"During the performance of the practical test, on either occasion, except as otherwise indicated, the use of any device with Internet access is prohibited. If during the performance of the practical test, there are indications of unauthorized use of these devices, the student will be expelled from the classroom, and will proceed, according to Law 3/2022, of February 24, of university coexistence and the disciplinary regulation of the UDC student body.

Fraudulent completion of the tests and/or activities will directly imply a failing grade ("0") in the subject in the corresponding call, invalidating any grade obtained in all the activities for the next opportunity, if any, within the same academic course. It is considered fraudulent to carry out the activities, proposed to be completed in person in the classroom, which are done from outside the classroom, proceeding according to the regulations indicated in the previous paragraph."

The evaluation of students with recognition of part-time dedication and academic exemption from attendance will follow the same criteria, and will consist of the same tests as the rest of the students, adapting the requested activities to their circumstances.

RATING at the end of the evaluation process:

1. If the minimum requirements are met and they reach a minimum of 5 points, they pass the subject.
2. If the minimum score established in any of the partial tests is not reached (4.5/10 points), they will obtain an overall rating of the exam result.

The qualification of "Not Presented" will appear to those students who do not present themselves to the objective tests

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Sources of information

Basic	- R. A. Serway (2005). Electricidad y Magnetismo.. México. Thomson. - J.R. Reitz, F.J. Milford y R.W. Christy (1993). Fundamentos de la teoría electromagnética. . Addison-Wesley Iberoamericana. - Tipler y Mosca (2011). Física. Volumen 2. Reverté - Varios Autores (2022). Colección de Vídeos JOVE.
Complementary	E. Gullón de Senespleda (1976). Electricidad y magnetismo. Problemas de Física. Madrid: Internacional de RomoSantiago Burbano de Ercilla, Enrique Burbano Garcia, Carlos Gracia Muñoz (2006). Problemas de física. TébarRichard P. Feynman, Robert B. Leighton, Matthew Sands (1975). The Feynman lectures on physics Feynman física. Fondo Educativo InteramericanoRaymond A. Serway, John W. Jewett, Jr. (2014). Physics for scientists and engineers. Brooks/Cole, Cengage Learning

Recommendations

Subjects that it is recommended to have taken before

Numerical and Statistical Methods/610G04013

Fundamentals of Mathematics/610G04001

Integrated Basic Laboratory/610G04004

Subjects that are recommended to be taken simultaneously

Advanced Calculus /610G04009

Subjects that continue the syllabus

Physics of the Nanoscale/610G04041

Polymers/610G04028

Solid State/610G04022

Fundamentals of Quantum Theory/610G04015

Other comments



Green Campus Program Faculty of Sciences 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: to They will mostly be requested in virtual format. b. To be done on paper: - Plastics will not be used. - Double-sided printing will be carried out. - Recycled paper will be used. 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.

(*)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.