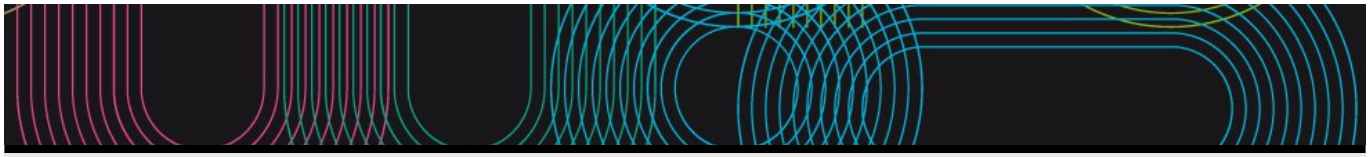

IDENTIFYING DATA				
Physics: Physics II				
Subject	Physics: Physics II			
Code	V09G311V01107			
Study programme	Grado en Ingeniería de los Recursos Mineros y Energéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Vázquez Dorrío, José Benito			
Lecturers	Vázquez Dorrío, José Benito Vijande López, Javier			
E-mail	bvazquez@uvigo.es			
Web	http://www.clickonphysics.es/			
General description	Physics 2 is a fundamental subject that consists of 6 ECTs and that has a clear bridging function that adapts the knowledge in Physics with which students theoretically enter the School of Mining and Energy Engineering. Likewise, the contents of the subject, balanced in terms of theoretical and practical aspects, serve as a focus and reference for a large part of the scientific-technological subjects of the Degree. Some of the credits of the subject address more specific content required to provide a broad base of knowledge that allows an appropriate development in today's highly technical world, facilitating the subsequent acquisition of the necessary theoretical-practical skills and abilities related to professional performances with a global approach within the field of engineering and with a specific focus for graduates of the School of Mining and Energy Engineering. This subject has as a specific competence the understanding and mastery of the basic concepts of the general laws of Optics and Electromagnetism and their application to solve engineering problems. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
A1	That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
A2	That the students know how to apply their knowledge to their work or vocation in a professional way and that they possess the competences that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
A3	That the students have the capability to gather and interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues
A4	That the students can transmit information, ideas, problems and solutions to a specialized and non-specialized audience
A5	That the students develop those learning capabilities necessary to undertake further studies with a high degree of autonomy.
C4	Understanding and mastery of the essential concepts of the general laws of mechanics, thermodynamics, fields and waves and electromagnetism, and their application for solving specific problems in the field of engineering.
D1	Ability to draw links between the different elements of all the knowledge they acquired, understanding them as components of a body of knowledge with a clear structure and strong internal cohesion.
D3	To suggest and develop practical solutions, using the relevant theoretical knowledge, to phenomena and problems-situations of ordinary reality that are specific to engineering, developing appropriate strategies.
D4	To foster collaborative working, communication, organization and planning skills, along with the ability to take responsibilities in a multilingual, multidisciplinary work environment that promotes education for equality, peace and respect for fundamental rights.

D5	To be familiar with the relevant sources of information, including constant updating, in order to practice one's profession competently, accessing all the present and future tools of information search, constantly adapting to technological and social changes.
D10	To become aware of the need for continuous training and the constant improvement of quality, developing the values that are characteristic of scientific thinking, showing flexible, open and ethical attitudes in the face of different situations and opinions, particularly as regards non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
Understand the basics of Electromagnetism.	A1 A2 A3 A4 A5	C4	D1 D3 D4 D5 D10
Know the fundamentals of the experimental process used when working with Electromagnetism	A1 A2 A3 A4 A5	C4	D1 D3 D4 D5 D10
Develop practical solutions to phenomena and problem-situations of everyday reality in general and Electromagnetism in particular.	A1 A2 A3 A4 A5	C4	D1 D3 D4 D5 D10
Understand that scientific knowledge arises from a process of elaboration in interaction with technology and linked to the characteristics and needs of society at each historical moment.	A1 A2 A3 A4 A5	C4	D1 D3 D4 D5 D10
Know how to evaluate information from different sources in order to form one's own opinion and to be able to express oneself critically on current scientific and technological problems related to electromagnetism.	A1 A2 A3 A4 A5	C4	D1 D3 D4 D5 D10

Contents

Topic	
NATURE AND PROPAGATION OF THE LIGHT	Nature of the light. Fermat's principle. Reflection and refraction of the light. Total reflection: Angle limit.
OPTICAL SYSTEMS	Dioptria: spherical and flat. Lateral magnification
OPTICAL INSTRUMENTS: LENS	Spherical lenses. Thin lenses. Ray tracing. The eye as an optical instrument.
ELECTROSTATICS. THE ELECTRICAL FIELD IN VACUUM	Electric charge. Conductors and insulators. Coulomb's law. Electric field. Gauss's law. Electric field in a conductor. Capacitors. The electric dipole: Actions of the electric field on a dipole.
ELECTROSTATICS. THE ELECTRICAL FIELD IN DIELECTRICS	The vector polarisation. Polarisation charges.
ELECTROSTATIC ENERGY	Introduction. Potential energy of a group of point charges. Energy of a charged capacitor.
DIRECT CURRENT	Electric current. Current intensity. Current density. Ohm's Law. Joule's Law. Electric generator. Electromotive force. Direct current circuits. Kirchhoff's Law.
MAGNETOSTATICS. THE MAGNETIC FIELD IN THE VACUUM	Magnetic force on a moving charge. Magnetic induction. Actions of the magnetic field on a linear conductor through which an electric current is flowing. Biot and Savart's Law. Ampère's Law of Circulation. Magnetic flux.
MAGNETOSTATICS. THE MAGNETIC FIELD IN MATERIAL MEDIA	Magnetisation of matter. The magnetic field strength vector. Magnetic susceptibility and permeability. Ferromagnetism.
TIME-DEPENDENT ELECTROMAGNETIC FIELDS	Faraday's law of induction and Lenz's law. Mutual induction. Self-induction.
ALTERNATING CURRENT	RMS value of a periodic function. RLC series circuit. Reactance. Impedance. Resonance. Power in alternating current circuits. Alternating current circuits. Complex formulation.
ELECTROMAGNETIC WAVES	Ampere's Generalized Law. Maxwell's equations. Electromagnetic spectrum.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	25	32.5	57.5
Problem solving	10	15	25
Laboratory practical	10	10	20
Seminars	2.5	2.5	5
Seminars	2.5	17.5	20
Problem and/or exercise solving	1	8	9
Problem and/or exercise solving	1	8	9
Report of practices, practicum and external practices	0.5	4	4.5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Presentation of the subject contents by the lecturer. Performing teaching experiments. Flipped classroom
Problem solving	Approach, analysis, resolution and debate of a problem or exercise related with the topics of the subject
Laboratory practical	Practical application of the theory of a field of knowledge in a specific context. Practical exercises through the various laboratories.
Seminars	Time reserved by each lecturer to address and resolve the doubts of the students with the function of guiding and guiding the learning process
Seminars	In-depth work on a topic. Expansion and relation of the contents given in the magisterial sessions. Project Based Learning

Personalized assistance	
Methodologies	**Description**
Seminars	Time reserved by each teacher to address and resolve the doubts of the students. The attention can be individual or in small groups, according to the nature of the attention and normally takes place in the teacher's office or in the classroom if necessary. In these activities, the teacher's role is to guide and guide the learning process of the students and help them to successfully carry out the corresponding autonomous work. The teachers indicate the place, day and time for this personalized attention in the first days of class and can be consulted in the PROFESORADO section of the center's website: http://minaseenerxia.uvigo.es/es/ . For all teaching modalities, tutoring sessions may be carried out by telematic means (email, videoconference, Moovi forums, ...) after prior consultation.
Seminars	In specific seminar sessions, the teaching staff monitors the work of each group, providing the necessary material for its completion when the students cannot get it. The resolution of doubts is carried out in these seminar sessions and in the group tutoring hours. For all teaching modalities, tutoring sessions may be carried out online (email, videoconference, Moovi forums, ...) after prior consultation
Laboratory practical	Laboratory practices are carried out in groups under the supervision of the teaching staff. The resolution of doubts is carried out during each laboratory practice session and, later, if the students require it, during the tutoring hours individually or in groups. For all teaching modalities, tutoring sessions may be carried out online (email, videoconference, Moovi forums, ...) after prior consultation.
Problem solving	The resolution of doubts is carried out during the seminar sessions and during the tutoring hours individually. For all teaching modalities, tutoring sessions may be carried out online (email, videoconference, Moovi forums, ...) after prior consultation.
Lecturing	The resolution of doubts is carried out during the tutoring hours individually or in groups. For all teaching modalities, tutoring sessions may be carried out online (email, videoconference, Moovi forums, ...) after prior consultation.
Tests	**Description**
Report of practices, practicum and external practices	The reports of laboratory practices are carried out individually or in groups following the instructions of the teaching staff. The resolution of doubts is carried out during the hours of the laboratory practices or during the hours of tutorials. For all teaching modalities, tutoring sessions may be carried out online (email, videoconference, Moovi forums, ...) after prior consultation.
Problem and/or exercise solving	The resolution of doubts is carried out during the seminar sessions and during the tutoring hours individually. For all teaching modalities, tutoring sessions may be carried out online (email, videoconference, Moovi forums, ...) after prior consultation.

Problem and/or exercise solving	The resolution of doubts is carried out during the tutoring hours individually or in groups. For all teaching modalities, tutoring sessions may be carried out online (email, videoconference, Moovi forums, ...) after prior consultation.

Assessment

	Description	Qualification	Training and Learning Results
Lecturing	Written exam of 12 short answer questions. EXPECTED RESULTS FROM THIS SUBJECT: Understand the basics of Electromagnetism. Develop practical solutions to phenomena and problem-situations of everyday reality in general and Electromagnetism in particular. Know how to evaluate information from different sources in order to form one's own opinion and to be able to express oneself critically on current scientific and technological problems related to electromagnetism.	35	A1 C4 D1 A2 D3 A3 D4 A4 D5 A5 D10
Problem solving	Written exam of 3 exercises. EXPECTED RESULTS FROM THIS SUBJECT: Understand the basics of Electromagnetism. Develop practical solutions to phenomena and problem-situations of everyday reality in general and Electromagnetism in particular. Know how to evaluate information from different sources in order to form one's own opinion and to be able to express oneself critically on current scientific and technological problems related to electromagnetism. Understand that scientific knowledge arises from a process of elaboration in interaction with technology and linked to the characteristics and needs of society at each historical moment.	35	A1 C4 D1 A2 D3 A3 D4 A4 D5 A5 D10
Laboratory practical	Laboratory report. EXPECTED RESULTS FROM THIS SUBJECT: Understand the basics of Electromagnetism. Develop practical solutions to phenomena and problem-situations of everyday reality in general and Electromagnetism in particular. Know how to evaluate information from different sources in order to form one's own opinion and to be able to express oneself critically on current scientific and technological problems related to electromagnetism. Understand that scientific knowledge arises from a process of elaboration in interaction with technology and linked to the characteristics and needs of society at each historical moment.	15	A1 C4 D1 A2 D3 A3 D4 A4 D5 A5 D10
Seminars	Work report. EXPECTED RESULTS FROM THIS SUBJECT:Develop practical solutions to phenomena and problem-situations of everyday reality in general and Electromagnetism in particular. Know how to evaluate information from different sources in order to form one's own opinion and to be able to express oneself critically on current scientific and technological problems related to electromagnetism. Understand that scientific knowledge arises from a process of elaboration in interaction with technology and linked to the characteristics and needs of society at each historical moment.	15	A1 C4 D1 A2 D3 A3 D4 A4 D5 A5 D10

Other comments on the Evaluation

1.- Two Continuous Assessment (CA) opportunities are proposed:

a) First CA opportunity (at the end of the term). In order to facilitate a continuous evaluation during the term, two voluntary partial exams will be carried out (with contents of the Theory (T) master sessions and those of resolution of exercises/Problems (P)), which, if approved, will release the corresponding contents out of the final written exam of the First opportunity. To pass these voluntary partial exams it is necessary to obtain a minimum grade of 3.50 in the written exams (T and P) and an average (0.5*(T+P)) equal to or greater than 5. Each voluntary partial exam represents a 70 /3% of the subject grade. Other weekly Voluntary Theory Tests (PVT) or monthly Voluntary Problems Tests (PVP) only increase the final grade if a minimum average grade of 3.50 is reached in the written exams (T and P). Attendance to Group B (SB) and Group C (SC) sessions is compulsory, so the grade obtained in the Seminar Work Report/Physics Project (PF) and in the Laboratory Report will be weighted by taking into account the assistance to laboratory practices (L). The grade can be increased if Voluntary Laboratory Tests are undertaken (PVL).

b) Second opportunity CA (July). The values obtained previously in the following assessables are maintained: PVT, PVP, PVL, SB, SC, PF and L. The written exam now consists of 3 exercises and 9 short-answer questions and assumes as a whole, as in the First opportunity EC , 70% of the final mark.

In both EC opportunities the Final Note is obtained by the following formula:

Final Score = Score A + Score B + Score C

Score A = [(T + PVT) + (P + PVP)] * 0.35

Note B = (L + PVL) * SB * 0.15

Note C = (PF + PVL) * SC * 0.15

T1, T2, T3: Theory grade for blocks 1 (Optics), 2 (Electric Field) and 3 (Magnetic Field), respectively

P1, P2, P3: note of Problems of blocks 1 (Optics), 2 (Electric Field) and 3 (Magnetic Field), respectively

T: average of the theory grades

P: mean of the problem scores

T + PVT: the PVT note is added if both P and T are equal to or exceed 3.50 points

P + PVP: the PVP note is added if both P and T are equal to or exceed 3.50 points

L: average mark of the 5 laboratory practices

SB: attendance at sessions B (SB = number of sessions attended/5)

L + PVL: the PVL note is added if L is equal to or exceeds 3.50 points

PF: Physics Project note

SC: attendance at C sessions (SC = number of sessions attended/3)

PF + PVL: the note of the PVL is added if PF equals or exceeds 3.50 points

The students have a simulator for calculating qualifications in MooVi platform.

2.- Global Assessment (GA):

Those students who cannot comply with the continuous assessment (CA) method described above may apply for a single global assessment, understood as that which is carried out in a single academic act, which may include as many tests as are necessary to accredit that the student has acquired all the competences described in the this Teaching Guide.

Exam schedule. Verify/consult updates on the center's website: http://minaseenerxia.uvigo.es/gl/docencia/exames

Sources of information

Basic Bibliography

Sears, F.W.; Zemansky, M.W.; Young, H.D.; Freeman, R.A., **Física Universitaria**, 12, Pearson Educación, 2009

Tipler P.A., **Física para las ciencias y la tecnología**, 6, Reverté, 2010

Complementary Bibliography

Burbano de Ercilla, S.; Burbano García, E.; García Muñoz, C., **Problemas de Física**, 27, Mira Editores, 2006

Bauer, W.; Westfall, G., **Física para Ingeniería y Ciencias**, 2, McGraw-Hill, 2014

De Juana Sardón, J.M., **Física General**, 2, Pearson Prentice Hall, 2007

Recommendations

Subjects that continue the syllabus

Circuits and electrical machines/V09G311V01201
Electrical Technology/V09G311V01209

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus II/V09G311V01109

Subjects that it is recommended to have taken before

Physics: Physics I/V09G311V01102
Mathematics: Linear algebra/V09G311V01103
Mathematics: Calculus I/V09G311V01104

Other comments

The following previous knowledge is recommended: Basic knowledge of trigonometric, complex and vector algebra, as well as differential and integral calculus of functions of real variables.
Physics Projects webpage is recommended to be consulted to follow up on our Physics 2 gamified subject, to be used as a selfregulated
learning tool or in Project-Based Learning activities: http://www.clickonphysics.es/cms/
Videos of the YouTube channel are recommended to be followed in our Physics 2 gamified subject, to be used as a

selfregulated
learning tool or in Flipped Classroom activities: https://www.youtube.com/@josebenitovazquezdorrio3566
The own audios of the Spotify channel are recommended to be listened to to follow our Physics 2 gamified subject, to be used as a self-regulated learning tool or in Flipped Classroom activities:
https://podcasters.spotify.com/pod/show/josebenitovazquezdorrio