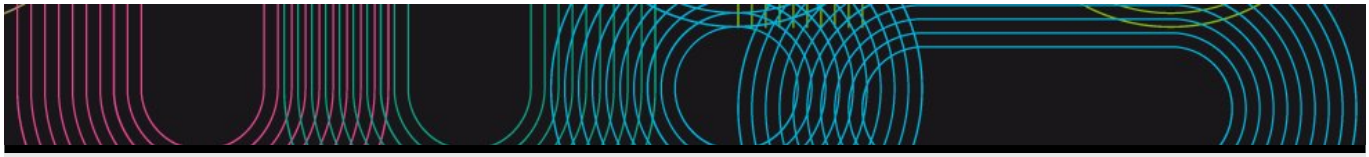

IDENTIFYING DATA				
Physics: Physics II				
Subject	Physics: Physics II			
Code	O07G410V01202			
Study programme	(*)Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Salgueiro Piñeiro, Jose Ramon			
Lecturers	Gómez Gesteira, Ramón Salgueiro Piñeiro, Jose Ramon			
E-mail	jsalgueiro@gmail.com			
Web	http://optics.uvigo.es			
General description	The matter of Physics II is fundamentally oriented to provide the training and basic competences on the basic electromagnetism, including its main theoretical practical aspects. 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.			

Competencies	
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
B2	Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
C2	Understanding and mastery of the basic concepts about the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and their application to solve problems related to engineering.
D1	Capability of analysis, organization and planification.
D3	Capability of oral and written communication in native lenguage
D4	Capability of autonomous learning and information management
D5	Capability to solve problems and draw decisions
D6	Capabiliity for interpersonal communication
D8	Capabiliity for critical and self-critical reasoning

Learning outcomes				
Expected results from this subject	Training and Learning Results			
Knowledge and understanding of the basic principles of Physics and their application to the analysis and to the resolution of problems in engineering	A1	B2	C2	D1 D3 D4 D5 D6 D8
Knowledge, understanding and application of the principles of electromagnetism, including telectrostatics, magnetostatics and Maxwell's equations.	A1		C2	D5 D8

Contents
Topic

Presentation of the course and historical introduction	Historical introduction.
Scalar and vectorial fields	Coordinate systems in two and three dimensions. Vectorial operators. Gradient of a scalar. Circulation of a vector. Flux. Divergence. Divergence theorem. Rotational. Stokes theorem.
Electrostatics	Charge and charge density. Coulomb's law. Electrostatic field. Flux of the electrostatic field. Gauss' law. Electrostatic potential. Poisson and Laplace equations. Energy of the electrostatic field. Potential multipolar expansion. Dipoles. Conductors and dielectrics. Electrostatics in presence of matter. Capacitors.
Electrical current and magnetostatics	Current and current density. Continuity equation. Ohm's law. Conductivity and resistivity. Introduction to the magnetic field. Force between currents. Magnetic induction. Lorentz' force. Biot and Savart's law. Magnetic flux. Ampère's law. Vector potential. Multipolar vector-potential expansion. Magnetic dipoles. Magnetism in presence of matter. Magnetic response of materials. Magnetic field. Hysteresis.
Electrical circuits	Association of resistors. Electromotive force. Dynamos. Electrical circuit. Power and energy. Voltage and current sources. Voltage, current and resistance measurement. Kirchhoff's laws and circuit analysis. Superposición, Thévenin and Norton theorems.
Introduction to electrodynamics	Faraday's induction law. Inductance. Dynamos, engines and transformers. Magnetic energy. Maxwell's displacement current. Maxwell's equations. Systems of units.
Introduction to the waves	One-dimensional waves. Harmonic waves. Phase velocity. Complex notation. Three-dimensional waves. Plane, spherical and cylindrical waves. Energy carried by a wave. Huygens' principle. Superposition of waves of different frequency. Group velocity.
Electromagnetic waves	Wave equation for electromagnetic waves. Hertz' experiment. Electromagnetic spectrum. Propagation of electromagnetic waves. Electromagnetic energy. Poynting's vector. Radiometric units. Polarisation. Reflection and refraction. Interference and diffraction.
Radiation-matter interaction	Types of interaction. Dipolar radiation. Model of electronic oscillator. Rayleigh scattering. Dispersion in dielectrics: Lorentz model. Dispersion in metals: Drude model.
Laboratory	Measurement of basic electromagnetic properties with multimeter and oscilloscope. Measurement of the capacity of a capacitor. Laplace's law. Helmholtz coils. Terrestrial magnetic field measurement. Magnetic momentum. Electromagnetic induction. Electrical circuits.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	40	60
Laboratory practical	12	18	30
Problem solving	7	10.5	17.5
Introductory activities	1	0	1
Seminars	10	15	25
Essay questions exam	2.5	0	2.5
Practices report	0	14	14

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

Methodologies

	Description
Lecturing	Classes one hour long to exposed the main theoretical concepts of the matter.
Laboratory practical	Development of experiments in laboratory to illustrate the main theoretical concepts previously developed on the lectures.
Problem solving	Resolution of selected exercises similar to those the student will face later in an autonomous way.
Introductory activities	Presentation of the subject and lecturers. Presentation of the laboratory.
Seminars	Approach, discussion and resolution of questions and problems in relation with the theoretical concepts previously developed in lectures.

Personalized assistance

Methodologies	Description
Laboratory practical	The lecturer individually explains the development of the experiments to be carried out at the laboratory.

Lecturing	The lecturer individually supervises the correct assimilation of the theoretical concepts developed in the lectures.
Seminars	The lecturer individually supervises resolution of the problems proposed in the seminar lectures.
Introductory activities	Presentation of the subjects at the beginning of the course.
Problem solving	The lecturer solves problems of similar difficulty to those the student will face later in an autonomous way.

Assessment

	Description	Qualification	Training and Learning Results		
Essay questions exam	Two partial examinations: problem solving and questions (10% each one). A final exam (60%). In case the student does not attend the partial exams, the final exam will suppose 80% of the total mark.	80	A1	C2	D1 D3 D8
Practices report	Inform and (if necessary) oral presentationabout the activities realized at the laboratory. The students that do not attend the laboratory will be specifically evaluated abut this topic together with the final examination.	20	B2	C2	D1 D3 D4 D5 D6 D8

Other comments on the Evaluation

The marks of the partial examinations and laboratory report will be maintained in June/July.

In case the student does not attend the partial examinations, the final examination will rank 80% of the mark and the students not attending the laboratory sessions will be evaluated about such topics on the day of the final exam.

Evaluation dates: the examinations calendar is published at the website: http://aero.uvigo.es/gl/docencia/exames

Sources of information

Basic Bibliography

Griffiths, D.J, **Introduction to electrodynamics**, 3ª edición, Prentice Hall,

Wangsness, R. K., **Campos electromagnéticos**, Limusa, 1983

Burbano de Ercilla, **Física General**, Mira, Zaragoza,

Complementary Bibliography

Nilsson, J, **Circuitos eléctricos**, Addison Wesley Iberoamericana,

Feynman, R.P. Leighton R.B., **Lectures on Physics, Vol II**, Addison Wesley Publishing,

Cheng, D.K., **Fundamentos de electromagnetismo para ingeniería**, Addison Wesley Iberoamericana,

Edminister, J.A., **Circuitos Eléctricos**, McGraw-Hill,

Edminister, J.A., **Electromagnetismo**, McGraw-Hill,

Jackson J.D., **Classical electrodynamics.**, Elsevier, Amsterdam,

Serrano, V, **Electricidad y Magnetismo: Estrategias para la resolución de problemas y aplicaciones**, Prentice Hall,

Feynman, R.P. Leighton R.B., Sands M., **Exercises for the Feynman Lectures on Physics**, Addison Wesley Publishing,

Sabah, N.H., **Electric circuits and signals**, CRC Press,

Cheng, D.K., **Field and wave electromagnetics**, Addison Wesley Publishing,

Varios, **http://wikipedia.org**,

Recommendations

Subjects that are recommended to be taken simultaneously

Mathematics: Calculus II/O07G410V01201

Subjects that it is recommended to have taken before

Physics: Physics I/O07G410V01103
Mathematics: Calculus I/O07G410V01101