Teaching Guide					
Identifying Data					2016/17
Subject (*)	Electronics Technology			Code	614G01005
Study programme	Grao en Enxeñaría Informática				
Descriptors					
Cycle	Period	Year		Type	Credits
Graduate	2nd four-month period	First		FB	6
Language	SpanishGalicianEnglish				
Teaching method	Face-to-face				
Prerequisites					
Department	Electrónica e Sistemas				
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Web	moodle.udc.es/				
General description	Physical principles of semiconductors and logic families. Electronic and photonic devices. Electronic circuits.				

Study programme competences	
Code	Study programme competences
A2	Comprensión e dominio dos conceptos básicos de campos e ondas, e electromagnetismo, teoría de circuítos eléctricos, circuítos electrónicos, principio físico dos semicondutores e familias lóxicas, dispositivos electrónicos e fotónicos e a súa aplicación para a resolución de problemas propios da enxeñaría.
B1	Capacidade de resolución de problemas
B3	Capacidade de análise e síntese
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.

Learning outcomes			
Learning outcomes	Study programme competences		
To learn fundamental physical concepts governing computer functioning: electrical and electronic circuits.	A2	B1 B3	C2 C6
Practical applications of the solid-state devices and analog and digital integrated circuits.	A2	B1 B3	C2 C6

Contents	
Topic	Sub-topic
Lesson 1. Electric circuits	1.1 Basic concepts of electricity. Ohm's Law. 1.2 Voltage and current sources. Electric power. 1.3 Waveforms. Fundamental values. 1.4 Electric circuits. Kirchhoff's rules. 1.5 Circuit theorems.

Lesson 2. Charging and discharging capacitors	2.1 Behavior of the capacitor properties over time. 2.2 R-C circuit in time domain. 2.3 R-C circuits: integrator and differentiator.
Lesson 3. p-n junction diodes	3.1 Physical principles of the semiconductor devices. 3.2 p-n junction in open circuit. 3.3 Polarized p-n junction. 3.4 Diode V-I characteristic. 3.5 Avalanche diode. 3.6 LED. Photodiode. 3.7 Lineal models of the diode. 3.8 Applications
Lesson 4. Transistor	4.1 MOSFET unipolar transistor. 4.2 Enhancement-mode MOSFET: n-channel and p-channel. 4.3 V-I characteristic in common-source mode. 4.4 Operational regions and linear equivalent models. 4.5 Graphical analysis of the NMOS in common-source mode. 4.6 MOSFET transistor in switching mode. 4.7 Bipolar Junction Transistor (BJT).
Lesson 5. Logic Families	5.1 Introduction. General properties of the digital circuits. 5.2 Properties of the CMOS inverter. 5.3 Other CMOS gates. 5.4 CMOS families. 5.5 CMOS logic cabling. 5.6 CMOS Properties. 5.7 TTL logic families.
Lesson 6. Amplifiers	6.1 Properties of the amplifiers. 6.2 Operational amplifier. 6.3 Applications.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A2 B1 B3 C2 C6	30	42	72
Laboratory practice	A2 B1 B3 C2 C6	20	30	50
Problem solving	A2 B1 B3 C2 C6	10	14	24
Mixed objective/subjective test	A2 B1 B3 C2 C6	3	0	3
Personalized attention		1	0	1
(*)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	Educational exposition, using both slides and blackboard, of the theoretical contents of the subject. Examples.
Laboratory practice	Students will solve exercises in the electronics laboratory with the aim of learning the basic usage of fundamental instrumentation devices (multimeter, power supply, arbitrary function generation, and oscilloscope). Students will also become familiar with measurement processes in real-world circuits. Students will also solve practical exercises using a PC equipped with the electronic circuits simulation software LTspice with the objective of getting used to the computer-aided circuits design and analysis.

Problem solving	Students learn how to formulate and solve representative exercises. They also gather together in small groups in order to share their knowledge and discuss some results.
Mixed objective/subjective test	Exam about the contents of the subject combining theoretical questions with practical exercises.

Personalized attention	
Methodologies	**Description**
Guest lecture / keynote speech Laboratory practice Problem solving	Guest lecture/keynote speech: To solve questions from the students related to the theoretical concepts introduced during the lectures. Laboratory practice; To solve questions from the students related to the proposed exercises to be solved in the electronics laboratory with the help of the basic instrumentation equipment. Problem solving; To solve questions from the students related to the proposed exemplary exercises. In all cases, communication with the students will take place using the individual tutoring hours, through email, or by making use of the corresponding Moodle tools.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Laboratory practice	A2 B1 B3 C2 C6	Evaluation of the exercises solved by the student in the electronics laboratory using mixed tests.	20
Problem solving	A2 B1 B3 C2 C6	Evaluation, by means of mixed tests, of the exemplary exercises solved by the student.	10
Mixed objective/subjective test	A2 B1 B3 C2 C6	Final evaluation of the theoretical concepts and problem solving skills.	70

Assessment comments

The evaluation of this subject consists of: - final exam including theoretical questions and practical exercises, - exams corresponding to the laboratory practice (exercises related to the electronics laboratory using the instrumentation equipment and the LTspice software). - Problem-solving tests during the lecture period. The final mark is obtained as follows: Final mark = A + B + C, where: A = mark corresponding to the final exam (0 to 7), B = mark corresponding to the laboratory exercises (0 to 2), and C = mark corresponding to the problem-solving tests (0 to 1). To pass the subject the final mark must be greater than or equal to 5. In the second opportunity (July) only the final exam can be repeated (A). Marks corresponding to the laboratory exercises (B) and problem-solving tests (C) correspond to those obtained during the lecture period. For the Early Assessment Opportunity the same criteria as for the second opportunity will apply.

Sources of information	
Basic	- (). . Apuntamentos da materia. Profesores da materia.Circuitos eléctricos. Schaum. J.A.Edminister. Ed. McGraw Hill.Electrónica. Allan R. Hambley. Ed. Prentice HallElectronics. Allan R. Hambley. Ed. Prentice Hall
Complementary	Electricidad Básica. Problemas Resueltos. Julio C. Brégains y Paula M. Castro. Ed. Starbook, ISBN 978-84-15457-25-1, 2012.Electrónica Básica. Problemas Resueltos. Julio C. Brégains y Paula M. Castro. Ed. Starbook, 2012. Introducción al análisis de circuitos. Robert L. Boylestad. Ec. Prentice HallIntroducción al análisis de circuitos. Un enfoque sistémico. Donald E. Scott. Ed. McGraw Hill.Microelectrónica. Circuitos y sistemas analógicos y digitales. Jacob Millman. Ed. Hispano Europea.Circuitos microelectrónicos. Adel S. Sedra y Kenneth C. Smith. Ed. OxfordPrincipios de electrónica. A.P.Malvino. Ed. McGraw-Hill.Electrónica: teoría de circuitos y dispositivos electrónicos. Robert L. Boylestad y Louis Nashelsky. Ed. Prentice Hall.Circuitos electrónicos. Análisis, simulación y diseño. Norbert R. Malik. Ed. Prentice Hall.Circuitos microelectrónicos. Análisis y diseño. M. H. Rashid. Ed. Thomson.

Recommendations
Subjects that it is recommended to have taken before
Computer Science Preliminaries/614G01002 Calculus/614G01003
Subjects that are recommended to be taken simultaneously
Fundamentals of Computers/614G01007
Subjects that continue the syllabus

Fundamentals of Computers/614G01007
Computer Structure/614G01012
Networks/614G01017
Concurrency and Parallelism/614G01018
Infrastructure Management/614G01025
Hardware Devices and Interfaces/614G01032
Other comments
Students in this subject should have a basic knowledge about differential and integral calculus as well as electromagnetism.