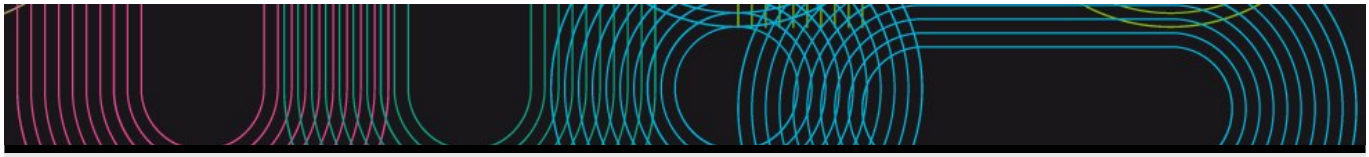

IDENTIFYING DATA				
(*)Física: Fundamentos de electrónica				
Subject	(*)Física: Fundamentos de electrónica			
Code	V05G300V01305			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Domínguez Gómez, Miguel Ángel			
Lecturers	Domínguez Gómez, Miguel Ángel Raña García, Herminio José Rodríguez Pardo, María Loreto			
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General description	The main purpose of this course is to provide students the basis for understanding and mastery of the principles of operation of devices and electronic circuits. It begins with a brief introduction to electronics in order to provide students with a global vision. Below are taught basic concepts on devices and basic electronic circuits: · Diodes and circuits with diodes, including concepts such as load line, ideal diodes, rectifiers, shaping circuits, logic circuits, voltage regulators and devices physics. · Characteristics of bipolar transistors, analysis of load line, large-signal models, polarization. · Study of the FET similar to the previous highlighting the MOSFET. · Check the circuit designs studied using SPICE. Mounting and verification using laboratory electronic instrumentation. · Logic digital circuits, with special emphasis on CMOS technology. Basics of logic circuits, inverter CMOS, NOR and NAND gates. A brief introduction to optoelectronics, their devices and their operating principles is also done. On the other hand, in the framework of the course takes place first contact of students with the electronics lab. Therefore, the main objective of the practical part of the course is the student to acquire the bases for a correct management of the most common instruments in the laboratories of electronics. The student, at the end of the course, must know correctly handle laboratory instruments, should distinguish and characterize the different components, and have practical skills in assembly and measurement. It will also start students in simulation of circuits, in order to introduce them to computer-aided design.			

Competencies	
Code	
A13	CE4/FB4: Comprehension and command of basic concepts in linear systems and their related functions and transforms; electric circuits theory, electronic circuits, physical principles of semiconductors and logical families, electronic and photonic devices, materials technology and their application to solve Engineering problems.
B4	The ability to use software tools that support problem solving in engineering

Learning aims	
Expected results from this subject	Training and Learning Results
Understanding and control of the basic concepts of the physical principles of semiconductors.	A13
Understanding and control of the basic concepts of operation of the electronic and photonic devices.	A13

Understanding and control of simple electronic circuits based on the electronic and photonic devices and their applications.	A13	
Understanding and control of the basic concepts of the logic families.	A13	
Basic knowledges on CAD (Computer Aided Design) tools for the simulation of electronic circuits.		B4
Capacity utilization of CAD tools for designing simple electronic circuits.		B4

Contents	
Topic	
Subject 1: Introduction	Electronic systems. Design process. Integrated circuits.
Subject 2: Diodes and circuits with diodes	Characteristics of the diode. Analysis of the load line. Ideal model of the diode. Rectifier Circuits. Clamping and clipping Circuits. Logic circuits with diodes. Voltage regulator circuits. Small signal equivalent linear circuits. Basic concepts of semiconductors. Physics of the diode.
Subject 3: Bipolar Junjction Transistors (BJT)	Operation of the npn Bipolar Junction Transistor (BJT). Analysis of the load line of an amplifier in common emisor. The pnp Bipolar Junction Transistor. Models of circuits. Analysis of circuits with BJTs.
Subject 4: Field Effect Transistors (FET)	NMOS Transistor. Analysis of the load line of a simplified NMOS amplifier. Polarization circuits. JFET and deplexion MOSFET transistors and channel p devices.
Subject 5: Digital logic circuits	Digital logic circuits. Basic concepts. Electrical specifications of the logic gates. The inverter CMOS. CMOS gates NOR and NAND.
Subject 6: Optoelectronics Devices	Introduction to the optoelectronics. Basic optoelectronics devices. Light emmitting devices: LED and LASER diodes. Light detecting devices: Light Dependent Resistors (LDRs), photodiodes and phototransistors. Optocouplers.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	2	4	6
Master Session	13	24	37
Troubleshooting and / or exercises	14	34	48
Laboratory practises	14	32	46
Short answer tests	2	0	2
Troubleshooting and / or exercises	5	0	5
Practical tests, real task execution and / or simulated.	5	0	5
Systematic observation	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	
	Description
Introductory activities	Presentation of the subject. Presentation of the laboratory practices and of the instrumentation and software that will be used.
Master Session	Exposition of the contents. Later personal work of the student reviewing the concepts seen in the classroom and preparing the subjects using the proposed bibliography. Identification of doubts that require to be resolved in personal tutorships.
Troubleshooting and / or exercises	Activity for formulate and resolve problems and/or exercises related with the subject. Complement of the theoretical sessions. Personal work of the student with resolution of problems and/or exercises proposed in the classroom and extracted of the bibliography. Identification of doubts that require to be resolved in personal tutorships.
Laboratory practises	Activities of application of the theoretical knowledges. It will learn to handle the typical instrumentation of a electronic laboratory and will implement basic electronic circuits seen in the theoric sessions. Also they will purchase skills of handle of simulation tools. Personal work of the student preparing the practices using the available documentation and reviewing the theoretical concepts related. Development and analysis of results. Identification of doubts that require to be resolved in personal tutorships.

Personalized attention	
Methodologies	**Description**

Master Session	Students will have opportunity to go to personal tutorships in the professor office. The doubts about the contents given by the professor will be resolved in the tutorships and students will be oriented about how to study it. Also, the doubts arisen to the students on the problems and/or exercises proposed and resolved in the classroom will be resolved as well as of other problems and/or exercises that can appear along the study of the subject. The doubts arisen to the students on the development of the practices of laboratory, the handle of the instrumentation, the implementation of the electronic circuits and the software of simulation will be resolved too.
Troubleshooting and / or exercises	Students will have opportunity to go to personal tutorships in the professor office. The doubts about the contents given by the professor will be resolved in the tutorships and students will be oriented about how to study it. Also, the doubts arisen to the students on the problems and/or exercises proposed and resolved in the classroom will be resolved as well as of other problems and/or exercises that can appear along the study of the subject. The doubts arisen to the students on the development of the practices of laboratory, the handle of the instrumentation, the implementation of the electronic circuits and the software of simulation will be resolved too.
Laboratory practises	Students will have opportunity to go to personal tutorships in the professor office. The doubts about the contents given by the professor will be resolved in the tutorships and students will be oriented about how to study it. Also, the doubts arisen to the students on the problems and/or exercises proposed and resolved in the classroom will be resolved as well as of other problems and/or exercises that can appear along the study of the subject. The doubts arisen to the students on the development of the practices of laboratory, the handle of the instrumentation, the implementation of the electronic circuits and the software of simulation will be resolved too.

Assessment

	Description	Qualification
Short answer tests	Tests to be carried out in the classroom, after each topic or group of topics exposed on the master session, to assess the knowledge acquired by the student. These tests will be of type test and/or issues.	20
Troubleshooting and / or exercises	Tests which will be carried out in the classroom throughout the year and that will evaluate the competencies of the student to resolve problems and/or the exercises over a part of the contents of the subject.	40
Practical tests, real task execution and / or simulated.	Tests to be carried out in the laboratory along the course on management of instrumentation, mounting of electronic circuits and simulation. The skills acquired by the student on the contents of the subject laboratory practices will be evaluated.	35
Systematic observation	Techniques aimed to collect data on the participation of the student, based on attendance, preparation of practices and carry out autonomous tasks.	5

Other comments on the Evaluation

1. Continuous evaluation

Following the own guidelines of the bachelor and the agreements of the academic commission will offer to the students a system of continuous evaluation. Students presented to the first test of resolution of problems and/or exercises shall be deemed that they opt for continuous evaluation. Those students who do not present to the first test of resolution of problems and/or exercises shall be deemed that they renounce to the continuous evaluation and will only have the possibility to present to the final examination. Students who do not follow the continuous evaluation and do not present to the final examination will be considered "not presented".

1.a Systematic observation

Teachers will evaluate the student attendance and the accomplishment of its autonomous tasks, getting the student a rating from 0 to 10 (OS).

The final note of systematic observation (NOS) will be:

NOS = 0.5*OS

1.b Theory

They will realise 4 tests of short answer properly programmed along the course. These tests will value from 0 to 10 and the final note of these tests will be the average (NPRC -> Note Test Short Answer):

NPRC = (NPRC1 + NPRC2 + NPRC3 + NPRC4)/4

They will realise 2 exams of resolution of problems and/or exercises properly programmed along the course. These exams will value from 0 to 10 and the final note will be the average (NPE -> Note of Problems and/or Exercises):

NPE = (NPE1 + NPE2)/2

It is necessary to obtain a minimum of 3 points in each one of these exams (NPE1 >= 3 and NPE2 >= 3) to pass the subject.

The final note of theory (NT) will be:

NT = 0.2*NPRC + 0.4*NPE

The tests and exams are not recoverable, that is to say, that if a student can not assist the day in that they are scheduled, the professor does not have obligation to repeat them. The note of the tests and exams to which was missing will be of 0.

1.c Practical

They will realise 2 practical proofs properly programmed along the course. These proofs will value from 0 to 10 and the final note of the practical (NP) will be:

NP = 0.35*[(NP1 + NP2)/2]

The practical proofs are not recoverable, that is to say, that if a student can not assist the day in that they are scheduled, the professor does not have obligation to repeat them. The note of the proofs to which was missing will be of 0.

1.d Final note of the subject

It should be obtain a minimum of 4 points on 10 in theory (NT >= 2.4) and in practical (NP >= 1.4) to pass the subject. Also it is necessary to obtain a minimum of 3 points on 10 in each one of the 2 exams of resolution of problems and/or exercises (NPE1 >= 3 and NPE2 >= 3)

The final note (NF) will be:

If NT >= 2.4 and NP >= 1.4 and NPE1 >= 3 and NPE2 >= 3 => NF = NOS + NT + NP

If NT < 2.4 or NP < 1.4 or NPE1 < 3 or NPE2 < 3 => NF = min {4.5; NOS +NT + NP}

2. Final exam

The students that do not follow the continuous evaluation or had a final mark lower than 5 (failed) in the continuous evaluation, will be able to present to a final exam.

The final exam will have a theoretical part and a practical one. The theoretical part will realise in the dates that establish the School and will consist in a exam type test and/or short questions and/or resolution of problems and/or exercises. This exam will be evaluated from 0 up to 10 and the final mark of theory (NT) will be the points of the exam multiplied by 0.6. The practices exam will realise in the corresponding laboratory in the dates that establish the School and will consist in a practical proof that will be evaluated from 0 up to 10 and the final mark of practices (NP) will be the points of the proof multiplied by 0.4.

By reasons of organisation of the groups of examination, the professors will open a period so that the students inscribe to the final exam of practices. Only they will be able to present to the final exam of practices those students that have inscribed in time and form of agreement to the norms indicated by the professors in the corresponding announcement.

The students that have opted by the continuous evaluation and failed and present to the final exam can do it only to the theoretical part or to the practice one or both. It will conserve them the mark that had in the continuous evaluation of the part to which do not present if the minimums marked in the continuous evaluation process were achieved. If they are not presented to the practice part, the practice note (NP) of the continuous evaluation is recalculated multiplying by 0.4 instead of by 0.35.

The final note (NF) will be:

If NT >= 2.4 and NP >= 1.6 => NF = NT + NP

If NT < 2.4 or NP < 1.6 => NF = min {4.5; NT + NP}

3. Recovery (July)

The announcement of recovery (July) will feature of a theoretical part and another practice with the same format that the final exam.

The students that present to this announcement can do it only to the theoretical part or to the practice or both. It will conserve them the mark that had in the ordinary announcement (continuous evaluation or final exam). The calculation of the final mark of the subject will realise as was explained in the section 2.

The final mark of the subject will be the best of the obtained by the student in the ordinary announcement and the recovery

one.

By reasons of organisation of the groups of examination, the professors will open a period so that the students inscribe to the recovery practices exam. Only they will be able to present to this exam those students that have inscribed in time and form of agreement to the norms indicated by the professors in the corresponding announcement.

4. Validity of the qualifications

The qualifications of the student of the theoretical and practical parts of the subject will be valid only for the academic course in which was obtained.

Sources of information
Hambley, A. R., **Electrónica**, 2ª ed., Prentice Hall,
Quintáns, C., **Simulación de circuitos electrónicos con OrCAD 16 Demo**, Marcombo,

Recommendations
Subjects that continue the syllabus
(*)Electrónica dixital/V05G300V01402
(*)Tecnoloxía electrónica/V05G300V01401

Subjects that it is recommended to have taken before
(*)Física: Análise de circuítos lineais/V05G300V01201