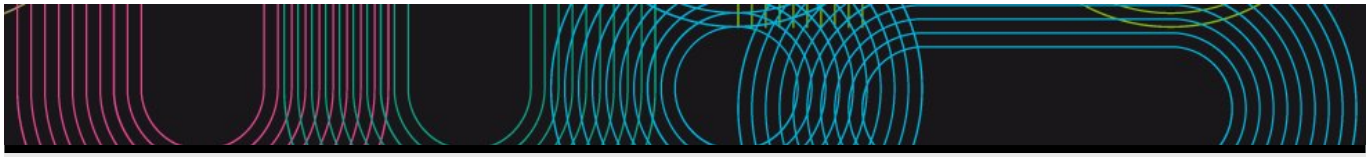

IDENTIFYING DATA				
(*)Tecnoloxía electrónica				
Subject	(*)Tecnoloxía electrónica			
Code	V05G300V01401			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Raña García, Herminio José			
Lecturers	Cao Paz, Ana María Quintáns Graña, Camilo Raña García, Herminio José Río Vázquez, Alfredo del Valdés Peña, María Dolores			
E-mail	hrana@uvigo.es			
Web	http://faitic.uvigo.es			
General description	This course devotes to the utilisation of integrated circuits, in particular operational amplifiers, as well as to the following fields: Electronics of Power, Electrotechnics in his slope of electrical installations and to the conversion of photovoltaic solar energy and thermal.			

Competencies	
Code	
A23	CE14/T9: The ability to analyze and design combinatory and sequential, synchronous and asynchronous circuits and the usage of integrated circuits and microprocessors.
A25	CE16/T11: The ability to use different energy sources, especially photovoltaic and thermal ones, as well as the fundamentals of power electronics and electronics
B4	The ability to use software tools that support problem solving in engineering
B5	The ability to use software tools to search for information or bibliographical resources

Learning aims		
Expected results from this subject	Training and Learning Results	
CE14/T9 Capacity of analysis and design of combinational and sequential circuits , both synchronous and asynchronous, and utilisation of microprocessors and integrated circuits.	A23	
CE16/T11 Capacity to use several sources of energy and especially the solar photovoltaic and thermal, as well as the fundamentals of electrotechnics and power electronics.	A25	
B4 CG13 Capacity to handle software tools that support the resolution of problems in engineering.		B4
CG14 Capacity to use computer tools of research of bibliographic resources or information.		B5

Contents	
Topic	
1 - Amplifiers	General concepts. Characteristics of amplifiers. Types of amplifiers. Small signal models the bipolar junction transistor (BJT). Physical interpretation of the hybrid parameters for common emitter (CE). Analysis of one-stage amplifiers with bipolar transistor in common emitter (CE), common base (CB) and common colector (CC)/emitter follower. Calculation of the input and output impedances, current gain and voltage gain. Small-signal model for field-effect transistors (FET) in low frequency. Analysis of one stage amplifiers with FETs in common source and common drain. Amplifiers with several stages.

2 - Frequency response in amplifiers	High-frequency models for transistors. Low-frequency and high-frequency equivalents for amplifiers. Calculation of the transfer function in the s plane. Application of Miller's theorem.
3 - Operational amplifiers I	Ideal operational amplifier (op amp). Transfer function. Equivalent model and ideal parameters. Open-loop operation (comparator). Feedback concept. Feedback effects. Closed-loop operational amplifier. Virtual ground. Inverter amplifier. Non-inverter amplifier. Real characteristics of operational amplifiers.
4 - Operational amplifiers II	Other basic circuits with operational amplifiers. Linear circuits: Inverter adder, differential amplifier. Non-linear circuits: half wave rectifier, peak detector - envelope demodulator. Schmitt trigger (inverter).
5 - Electrotechnics.	Components of an electrical installation. Protections. Rule.
6- Electronic of Power: introduction and devices	6-a: Introduction. Types of electronic power converters. The power switch. Elementary calculations in power electronics: power calculation; behaviour of coils; calculations of rms values; apparent power; factor of power; series of Fourier: components of frequency; harmonics; calculations of power with non-sinusoidal sources or with non-linear loads; total harmonic distortion. 6-b: electronic power devices. Classification. General characteristics. The power diode. The thyristor or SCR. The bipolar power transistor (BJT). The power MOSFET. The isolated-gate bipolar transistor (IGBT). The TRIAC. Cases. Disipadores.
7 - DC power supplies.	Introduction to the DC power supplies. Series voltage regulators. Introduction switching DC power supplies. DC converters: buck, boost. Isolated DC power supplies. General diagram of a switching DC power supply.
8 - Rectifiers and inverters.	7-a: Rectification: Introduction. Monofasical rectifiers (half wave, double wave). Controlled and not controlled, with resistive load and with R-L load. 7-b: Single phase inverters. Topologies. Analysis of the harmonic content. PWM Inverters.
9 - Solar energy photovoltaic and thermal conversion	Thermal and photovoltaic solar installations : The solar radiation that reaches the photovoltaic and thermal generators. Principle of operation of the photovoltaic and thermal reception installations . Thermal solar installations of high temperature. Thermal solar installations of low temperature. Isolated photovoltaic installations. Photovoltaic installations connected to power network. The solar cell. The photovoltaic generator. Design of photovoltaic systems. Generation and conversion of photovoltaic energy The battery and the voltage regulator. Types of batteries and operation modes. Types of regulators. Maximum power point tracking. Practical case of calculations of photovoltaic solar installations.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	18	18	36
Laboratory practises	22	22	44
Troubleshooting and / or exercises	6	12	18
Short answer tests	3	15	18
Troubleshooting and / or exercises	3	15	18
Practical tests, real task execution and / or simulated.	4	12	16

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

Methodologies

	Description
Master Session	The teachers explain the theoretical contents.
Laboratory practises	They include circuit mounting and testing and computer electronic circuits simulation. Some practical clases will also include some web search made by the student, about some technical information about some specific electronic devices used in the practical classes (e.g. some kind of transistors or operational amplifiers).
Troubleshooting and / or exercises	The teacher will solve exercises about most of the chapters.

Personalized attention

Methodologies	Description

Master Session	The professor will attend personally doubts and queries of the students, on the study of theoretical concepts, on exercises or on practices of laboratory. The students will have occasion to attend to *tutorías personalised in the dispatch of the professor in the schedule that the professors will establish to such effect to principle of course and that will publish in the page of the *asignatura.
Laboratory practises	The professor will attend personally doubts and queries of the students, on the study of theoretical concepts, on exercises or on practices of laboratory. The students will have occasion to attend to *tutorías personalised in the dispatch of the professor in the schedule that the professors will establish to such effect to principle of course and that will publish in the page of the *asignatura.
Troubleshooting and / or exercises	The professor will attend personally doubts and queries of the students, on the study of theoretical concepts, on exercises or on practices of laboratory. The students will have occasion to attend to *tutorías personalised in the dispatch of the professor in the schedule that the professors will establish to such effect to principle of course and that will publish in the page of the *asignatura.

Assessment

	Description	Qualification
Short answer tests	They make part of each partial examination of theory, in which they are half of its value. The number of tests and how they work are detailed in "Other comments and second call".	35
Troubleshooting and / or exercises	They make part of each partial examination of theory, in which they are half of its value.The number of tests and how they work are detailed in "Other comments and second call".	35
Practical tests, real task execution and / or simulated.	They are made in the laboratory. They consist of the kind of tasks made or prepared during the practices of the course: the practical exams consist of: 1) mounting of circuits, taking measures on them and answering questions related with these circuits and 2) simulation circuits equal or similar to the ones studied in the practices and answering questions related with this simulation. In the examinations of practices of laboratory the student will be allowed to use some especific technical information collected by the student during the practices (eg datasheets from manufacturers).	30

Other comments on the Evaluation

1. Continuous assessment:

The student is graded by means of a continuous assessment, which consists of "partial exams", including both written exams ("exámenes teóricos") and laboratory exams ("exámenes prácticos").

Nevertheless, a student may choose between that continuous assesment or a one-session exam ("examen final"). The rules of both kind of assessment are as follows:

1.1.Written exams ("exámenes teóricos"):

The theoretical contents of the course are divided into three blocks. The 1st block and the 2nd block are graded by means of a "partial theoretical exam" for each (examen parcial teórico). They take place in the usual weekly scheduling of the theoretical classes of the course. The 3rd block is graded by means of another exam which takes place only in the "final theoretical exam", the "(April-)May exam". All the student must attend at this 3rd block exam. The final theoretical exam consists of a "block exam" for each of the three blocks of the contents. The 1st and the 2nd block are made only by the students who did not pass the respective partial exam (grade

Sources of information

Hambley, A. R., **Electrónica**, Prentice-Hall, 2ª ed. en español,

Hart, D. W., **Electrónica de potencia**, Prentice-Hall,

Rashid, Muhammad H., **Electrónica de potencia: circuitos, dispositivos y aplicaciones**, Pearson Education,

Reglamento Electrotécnico para Baja Tensión (REBT) e Instrucciones Técnicas Complementarias (ITC),

Schneider Electric España, S.A., **Manual electrotécnico: Telesquemario (http://www.schneiderelectric.es)**, Schneider Electric España, S.A,

AENOR, **Norma UNE 60617 de Símbolos gráficos para esquemas eléctricos**,

Carta, J. A. y otros, **"Centrales de energías renovables: Generación eléctrica con energías renovables"**, Pearson-UNED,

Quintáns Graña, C., **Simulación de circuitos con OrCAD 16 DEMO**, Marcombo,

Recommendations

Subjects that continue the syllabus

(*)Electrónica analóxica/V05G300V01624
(*)Electrónica de potencia/V05G300V01625

Subjects that it is recommended to have taken before

(*)Física: Fundamentos de electrónica/V05G300V01305

Other comments

En la Tecnología "Sistemas electrónicos", la asignatura "Electrónica analógica" de 3er curso, continúa una parte del temario (amplificadores operacionales).