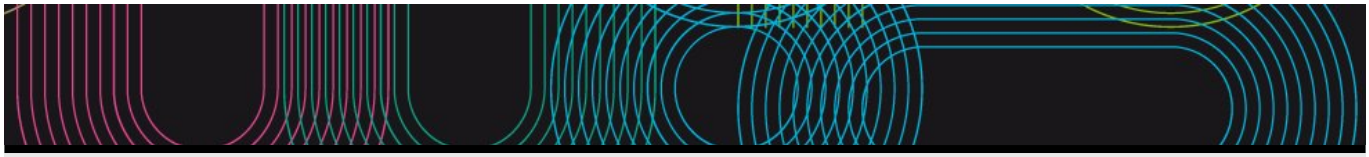

IDENTIFYING DATA				
Electronic Technology				
Subject	Electronic Technology			
Code	V05G300V01401			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Raña García, Herminio José			
Lecturers	Cao Paz, Ana María Quintáns Graña, Camilo Raña García, Herminio José Río Vázquez, Alfredo del Sánchez Real, Francisco Javier 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	
Operational amplifiers and other integrated circuits	Introduction to amplifiers: Appearances of frequency response in amplifiers. Bode diagrams. Principles of operation of an operational amplifier. Application circuits for operational amplifiers. Other integrated circuits of general application.
Power Electronics (I)	Introduction to Power Electronics. Power electronic devices .
Power Electronics (II)	DC power supplies. DC-DC converters.
Power Electronics (III)	Single-phase rectifiers. Single-phase inverters.

Electrotechnics	Electrical installations. Protections.
Photovoltaic and thermal solar energy	Photovoltaic and thermal solar installations. Photovoltaic cells. Photovoltaic panels. Photovoltaic systems of energy conversion.

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, about the study of theoretical concepts, about exercises or about practices of laboratory. The students may attend to these doubt/query sessions in the professor office in the schedule that the professors will establish at the beggining of the academic course. This schedule will be published in the page of the course. Some practical clases will include some web searchs 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).
Laboratory practises	The professor will attend personally doubts and queries of the students, about the study of theoretical concepts, about exercises or about practices of laboratory. The students may attend to these doubt/query sessions in the professor office in the schedule that the professors will establish at the beggining of the academic course. This schedule will be published in the page of the course. Some practical clases will include some web searchs 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 professor will attend personally doubts and queries of the students, about the study of theoretical concepts, about exercises or about practices of laboratory. The students may attend to these doubt/query sessions in the professor office in the schedule that the professors will establish at the beggining of the academic course. This schedule will be published in the page of the course. Some practical clases will include some web searchs 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).

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

NOTE: the lengths of the partial proofs specified in this section 'assesments' as "half an hour", "an hour", "two hours", probably will be shortened in a small percentage to make fit the proofs to the length of the class sessions. During the class period of teaching of the course, the exact length of these proofs will be published.

1. Continuous assesment:

The assesment of the course is made by means of a continuous assesment, that consists of partial proofs, both theoretical partial proofs as well as lab partial proofs. Nevertheless the student may choose instead a final examination as an alternative. The rules for the assesment are described in the following paragraphs.

If a student can not attend to a partial proof on the date it is programmed, the professors do not have obligation to repeat it. The qualifications of the partial proofs will be valid only for the academic course in which they take place .

To participate in the partial proofs of practices of laboratory the student must attend to all the laboratory practical classes. The students that do not fulfil this requirement can anyway attend to the partial proofs of theory and liberate themselves from its contents for the final examination of theory, according with the following explanations.

1.1. Theoretical proofs:

On the contents of theory there are during the four-month period two partial proofs that cover the 1st block and the 2nd block of the theory contents. There is no standalone '3rd partial proof'; the 3rd block of the theory is evaluated as a part of the final theory proof in the May final proof, in which participate all the students.

If the student gets a mark of 5 points (out of 10) in a partial proof, then he or she does not attend to the proof of its content in the final proof and the mark obtained is saved for the final proof (or May proof). If a student does not pass the partial proof, his/her mark is not saved for the final proof and so this marks works as a zero.

The weight of the theoretical proofs is 70% on the total of the final mark. This weight is 70%/3 for each block.

The partial proofs ('1st partial proof' and '2nd partial proof', either of theory or of laboratory practices) take place on the usual weekly scheduling of the classes. Their length is 2 hours. They include both one half (in time and in mark) of short answer questions and one half exercises.

1.2. Assesment of laboratory practices:

The practices evaluate by means of practical tests, described above (laboratory proofs). There are two laboratory partial proofs that, unlike the theory, cover the contents of all the course. The two lab partial proofs allow the student to liberate from its contents; i.e., if the student gets a mark of at least 5 points (out of 10) in a lab partial proof, this mark is saved as mark for this block for the lab final proof in May; if so, the student will not attend the proof of this part in the lab final proof in May.

If the student gets a mark greater than 5 point in both lab partial proofs, he/she will have a lab mark note greater than 5 and he/she will not attend to the lab partial proof in May. In the same way as the theory, if the student has a mark smaller than 5 points in a lab partial proof, then his/her mark is not saved for the final proof and so this mark works as a zero.

The two lab partial proofs have both the same weight.

1.3. Students presented:

The student joins continuous evaluation if and only if he/she attends to any of the partial proofs (either theoretical or laboratory ones) . From that moment, the student is considered as presented, and if he/she doesn't attend to any other partial proof, his/her mark on it will be zero.

1.4. Requirements to pass the course

The requirements a student has to fulfil to pass the course are explained in the following paragraphs. We begin the

explanation back to forth in time: from July proof towards the May proof until the continuous assesment:

To pass the course the student needs a mark greater than 5 points as a whole. It must be taken in account that the weights are 7 points for the theory and 3 points for the lab. In addition, the mark in each section (i.e. both theory and lab) must be greater than 30% (3 points out of 10), in either type of evaluation (either continuous assesment or final examination whithout having joined the continuous assesment or july examination).

In the second call (July) (in which the evaluation of theory is no longer divided into blocks and the evaluation of practice is neither divided into blocks) the student must fulfill only the conditions stated in the previous paragraph. Nevertheless, in the final examination of May, in which the evaluation is made by blocks (three blocks in the contents of theory and two blocks in the contents of practices), the student needs a mark greater than 30 % (3 points out of 10) on every block.

To pass the course, the provisional final note of the course is considered. It is defined as:

ProvisionalFinalMark = TheoryMark x 0.7 + LabMark x 0.3

If TheoryMark and LabMark are both greater or equal that 3, then:

FinalMark = ProvisionalFinalMark

Else:

FinalMark = minimum {4.5 ; ProvisionalFinalMark}

The student passes the course if FinalMark is at least 5.

Being

TheoryBlockMark1, TheoryBlockMark2 and TheoryBlockMark3 the marks of each block of theory expressed over 10 points and

ProvisionalTheoryMark = (TheoryBlockMark1 + TheoryBlockMark2 + TheoryBlockMark3) /3, then:

If the mark of every block of theory is at least 3 points (out of 10), then:

TheoryMark = ProvisionalTheoryMark

Else: TheoryMark = minimum {ProvisionalTheoryMark ; 2.5}

In the same way:

Being LabBlockMark1 and LabBlockMark2 the marks of each lab block expressed on 10 points and

ProvisionalLabMark = (LabBlockMark1 + LabBlockMark2) /2, then:

If the mark of each one of the two blocks of practices is at least 3 (out of 10) , then:

LabMark = ProvisionalLabMark;

Else: LabMark = minimum {ProvisionalLabMark; 2.5}.

2. Evaluation by final proof

The students who do not join the continuous evaluation are evaluated in the final proof which consists of theoretical part and lab part. The theoretical part is the same for all the students that have not passed any partial proof, both the ones who failed them and the ones who didn't attend to them (the rules are explained in paragraph 1.1). For the "provisional final mark", the theory keeps the same weight as in the continuous assesment: 70%, divided into three equal parts for the three blocks, each of them divided into two halves of short answer questions and exercises.

The evaluation of lab practices for the students that did not join the continuous assesment is made by means of lab practices proof in the period of final proofs, in the dates fixed in the calendar of final proofs. His length is two hours.

The weight of the lab mark on the provisional final mark is the same as for the students of continuous assesment: 30%.

To pass the course in the final proof, the student must fulfill the same conditions for "provisional final mark" and conditions of minimum theory mark and lab mark stated on the paragraph 1.4.

VERY IMPORTANT: The students who want to attend to the final proof of the course must enroll for it, prior to the proof, by communicating with the professors of the course, either in person or by e-mail on May 13th, 2015. This preinscription is necessary to schedule the shifts for the lab proof, but does not force the student to attend; a student may enroll and finally

do not attend to the proof. Only the students who enroll on that date will have right to do the lab proof.

3. Second call (July)

The second call (July) proof, like the final proof of first call (May), consists of a theory proof and a practice proof, in the laboratory.

For the second call proof, all the paragraphs of the point 2 apply (□evaluation by final proof□).

To pass the course in this call, the student must fulfill the same conditions of "provisional final mark" and conditions of minimum theory mark and lab mark explained in the point 1.4, except that there is not minimum mark by blocks, i.e. :

To pass the course, we define the □provisional final mark□ of the course, which is:

ProvisionalFinalMark = TheoryMark x 0.7 + LabMark x 0.3.

If TheoryMark and LabMark are both greater or equal that 3, then:

FinalMark = ProvisionalFinalMark

Else:

FinalMark = minimum {4.5 ; ProvisionalFinalMark}

The student passes the course if FinalMark is at least 5.

All the students that have not passed the course in the first call (May) may attend to the two sections (theory and lab) of this proof. The rule of □highest mark□ which is compulsory for the total mark of all the courses, will apply in this course also extended to each section; i.e., the theory mark of each student to calculate ProvisionalFinalMark for the July markwill be the highest between the May theory mark and the July theory mark. The same for the lab mark.

VERY IMPORTANT: In the same way as stated in section 2 for the May final proof, the students who want to attend to the July proof must enroll to attend to it, by communicating with the professors of the course, either in person or by e-mail on June 17th, 2015 . This preinscription is necessary to schedule the shifts for the lab proof, but does not force the student to attend; a student may enroll and finally do not attend to the proof. Only the students who enroll on that date will have right to do the lab proof.

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., **Guía de diseño de instalaciones eléctricas (PDF de uso libre disponible en www.schneiderelectric.es)**, Schneider Electric España, S.A,

Guirado, R., **Tecnología eléctrica**, McGraw-Hill,

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

Analogue Electronics/V05G300V01624
Power Electronics/V05G300V01625

Subjects that it is recommended to have taken before

Physics: Analysis of Linear Circuits/V05G300V01201
Physics: Fundamentals of Electronics/V05G300V01305

Other comments

The student should have good knowledge about the course "Física: Fundamentos de Electrónica"/V05G300V01305 ("Physics: Electronics Fundamentals"/V05G300V01305), in both its theoretical contents as well as in the laboratory practic classes.