



IDENTIFYING DATA

Fundamentals of electronics

Subject	Fundamentals of electronics			
Code	V12G330V01402			
Study programme	Grado en Ingeniería en Electrónica Industrial y Automática			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Nogueiras Meléndez, Andres Augusto			
Lecturers	Marcos Acevedo, Jorge Nogueiras Meléndez, Andres Augusto			
E-mail	aaugusto@uvigo.gal			
Web	http://moovi.uvigo.gal/			
General description	This subject provides basic knowledge, both theoretical and practical, about the fundamental concepts of analog electronics.			

English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.

This is a translated version of the subject guide. In case of any discrepancy, the only one valid is the Spanish one.

Training and Learning Results

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C11	CE11 Knowledge of the fundamentals of electronics.
D2	CT2 Problems resolution.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
	B3	C11	D2 D9 D10
Understand the appearances related with the interconnection of basic devices	B3	C11	D2 D9
Understand the operation of the basic electronic devices	B3	C11	D2 D9
Analyse discreet circuits			D2 D9 D10
Analyse and design circuits amplifiers			D2 D9 D10
Use basic electronic instrumentation			D9 D10

Know and dominate the tools of simulation of devices

B3

D2

D9

D10

Check the operation of the electronic circuits

D9

D10

Contents

Topic	
Subject 1. Solid State Physics	Fundamental concepts. Introduction to solid state physics. PN Junction: balance, forward and reverse bias. Differences between an ideal diode and a real diode. Models of the diode. Understanding datasheets. Types of diodes.
Subject 2. Circuits with diodes	Clamping circuit. Limiter circuit. Rectifying circuits. Capacitors as filters.
Subject 3. Transistors.	Bipolar transistor (BJT). Field Effect Transistors (JFET and MOSFET). Models.
Subject 4. Amplification.	Concepts, parameters, classification. Biasing circuits. Small signal models of transistors. Frequency response.
Subject 5. Coupling of Amplifiers.	Capacitor coupling. Direct coupling. Multistage amplifiers. Power amplifiers.
Subject 6. Feedback	Concepts. Influence and advantages of the negative feedback. Types of negative feedback. Impedance dependence on feedback. Oscillators.
Subject 7. Operational Amplifiers.	Concept. Characteristics. Differences between the ideal and the real operational amplifier. Datasheets.
Subject 8. Applications of the Operational Amplifiers.	Linear applications: inverting, non inverting, follower, adder, subtractor, integrator, differentiator. Non linear applications no linear: generators, comparators, rectifiers, clampers, limiters and peak detectors. First order active filters.
Subject 9. Linear Regulated Sources	Concept. Types of regulators: series, parallel. Integrated voltage regulators. Applications.

Planning

	Class hours	Hours outside the classroom	Total hours
Case studies	0	16	16
Lecturing	23	0	23
Problem solving	15	29	44
Autonomous problem solving	0	27	27
Previous studies	0	20	20
Laboratory practical	15	0	15
Objective questions exam	2	0	2
Essay questions exam	3	0	3

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

Methodologies

	Description
Case studies	Before the sessions, students will be given activities to previously gain the needed skills and knowledge to understand the concepts. Also there are parts of the subjects that the students has to study by its own, based on the materials, guides and exercises suggested.
Lecturing	They will take place at the times set by the school direction. They will consist of a presentation by the teacher of relevant aspects of the subject that will be related to the subjects that the student previously had to work on. The active participation of the same is encouraged, which will have the opportunity to express doubts and questions during the session.
Problem solving	During lectures, when it is relevant, exercises or examples will be solved to enhance the acquisition of knowledge.
Autonomous problem solving	After all the lectures, the students must spend time studying the given topics. Any doubt or question can be answered or explained at the beginning of the following lecture.
Previous studies	All materials are given in advance, so the students can read them, make a brief analysis and start each lecture or laboratory sessions with some insight of them

Laboratory practical	<p>During the laboratory sessions, students will carry out activities of the following type:</p> <ul style="list-style-type: none"> - Assembly of circuits. - Use and configuration of electronic instrumentation - Measurements on circuits variables - Calculations related to assembly and/or verification of measurements - Collect and represent of acquired data <p>At the end of each laboratory session, each group will deliver to the professor the corresponding result sheets.</p>
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Personalized assistance

Methodologies	Description
Laboratory practical	Tutoring sessions are available, on demand, to have orientation on the topics of the subject. Use of email is accepted only for very short and specific questions.
Autonomous problem solving	Tutoring sessions are available, on demand, to have orientation on the topics of the subject. Use of email is accepted only for very short and specific questions.
Case studies	Tutoring sessions are available, on demand, to have orientation on the topics of the subject. Use of email is accepted only for very short and specific questions.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practical	<p>The Laboratory practices (PL) will be evaluated continuously (session by session).</p> <p>The evaluation criteria are:</p> <ul style="list-style-type: none"> - A minimum attendance at 80% of the sessions. - Punctuality. - Previous preparation of the practices. - Achieve knowledge acquisition from the session. <p>The practical sessions will be carried out in groups of two students.</p> <p>The scripts of the practices will be available to students in advance.</p> <p>The students will answer the results on a set of sheets, which they will deliver at the end of the practice. These sheets will serve to justify attendance and assess the use.</p> <p>Each one of the practical sessions will be evaluated on 10 points.</p>	20	C11	D10
Objective questions exam	<p>It will consist of two tests (EP1 and EP2) related to thematic blocks. Each one will have a weight of 20% of the total of the note</p> <p>They will be carried out, if possible, by telematic means.</p> <p>The tests will consist of multiple choice questions, closed answer questions and analysis problems with numerical answers.</p> <p>These tests are evaluated out of 10 points. If a minimum score of 2.5 points is not reached, the test score will be worth 0 points.</p>	40	B3	C11 D2 D9
Essay questions exam	<p>This written test (EP3) of an individual and face-to-face nature, will be carried out at the end of the semester, on the date and time established by the center's management.</p> <p>It may consist of a combination of the following types of exercises:</p> <ul style="list-style-type: none"> - Test-type questions. - Short answer questions. - Analysis problems. - Resolution of practical cases. <p>This test is evaluated out of 10 points. If a minimum score of 2.5 points is not reached, the test score will be worth 0 points.</p>	40	B3	C11 D2 D9

Other comments on the Evaluation

Laboratory Sessions Mark

The laboratory sessions mark [PL] is obtained from the marks of the 5 laboratory practices, with the following formula:

$$LP = (P1 + P2 + P3 + P4 + P5) / 5$$

Not having attending a practice implies that the note in that practice is zero.

Ordinary call for continuous assesment

The mark that will go to the mark register [NAEC] will be the weighted sum of the practical and self-assessment marks, calculated by the formula:

$$NAEC = 0.2 * PL + 0.2 * EP1 + 0.2 * EP2 + 0.4 * EP3$$

Ordinary call for global evaluation

It will be necessary to sit a theoretical exam [NTEG], on the date established by the center for the ordinary call, and a practical laboratory exam [NPEG], on a date to be agreed depending on the availability of laboratories and non-coincidence with other exams of the same course.

Each of these exams will be evaluated on a score of 10 points. If the theoretical exam is taken, and the student does not sit for the practical, the [NPEG] grade will be worth 0.

The mark that will go to the mark register [NAEG] will be the one calculated by the formula:

$$NAEG = (NTEG + NPEG) / 2$$

Extraordinary call for continuous evaluation

In this call, the laboratory session mark from the ordinary call [PL] will be kept, and it will be necessary to take a theoretical exam [ETEC], which will evaluate all the contents of the subject.

The mark that will go to the [NAEEC] record will be the weighted sum of the practical marks and the theoretical exam according to the following formula:

$$NAEEC = 0.2 * PL + 0.8 * ETEC$$

Extraordinary call for global evaluation

It will be necessary to sit a theoretical exam [NTEEG], on the date established by the center for the ordinary call, and a practical laboratory exam [NPEEG], on a date to be agreed upon depending on the availability of laboratories and non-coincidence with other exams of the same course.

Each of these exams will be evaluated on a score of 10 points. If the theoretical exam is taken, and the student does not show up for the practical, the [NPEEG] mark will be worth 0.

The mark that will go to the mark registry [NAEEG] will be the one calculated by the formula:

$$NAEEG = (NTEEG + NPEEG) / 2$$

End-of-program call

It will be necessary to sit a theoretical exam [NTFDC], on the date established by the center for the ordinary call, and a practical laboratory exam [NPFDC], on a date to be agreed depending on the availability of laboratories and non-coincidence with other exams of the same course.

Each of these exams will be evaluated on a score of 10 points. If the theoretical exam is taken, and the student does not show up for the practical, the grade [NPFDC] will be worth 0.

The mark that will go to the [NAFDC] minutes will be the one calculated by the formula:

$$NAFDC = (NTFDC + NPFDC) / 2$$

Recommendations

In the different written tests, students are advised to justify all the achieved results.

When scoring the questions, both laboratory and written tests, no results will be given by empty assumption and the method used to reach the proposed solution will be taken into account.

It is recommended, in the presentation of the various exercises, not to present misspellings and illegible characters or symbols, because they will affect the final score.

Exams that are missing any of the sheets that accompany the statement will not be corrected.

Notes, books or electronic devices may not be used during the tests, with the exception of calculators.

Ethical Commitment

Whoever takes the subject is expected to present correct ethical behavior. In the case of detecting unethical behavior (copying, plagiarism, use of unauthorized electronic devices, and others) it will be considered that it does not meet the necessary requirements to pass the subject. In this case, the overall grade for this academic year will be fail (0.0) and the center management will be notified for the appropriate purposes.

Sources of information

Basic Bibliography

Boylestad, R.L., Nashelsky, L., **Electrónica: Teoría de circuitos y dispositivos electrónicos**, 11ª, Prentice-Hall, 2018

Malik N.R., **Circuitos Electrónicos. Análisis, simulación y diseño**, Prentice-Hall, 1996

Malvino, A; Bates, D., **Principios de Electrónica**, 7ª, McGraw-Hill, 2007

Complementary Bibliography

Rashid, M.H., **Circuitos microelectrónicos. Análisis y diseño**, Thomson, 2002

Pleite Guerra, J., Vergaz Benito, R., Ruíz de Marcos, J.M., **Electrónica analógica para ingenieros**, McGraw-Hill, 2009

Hambley, A.R., **Electrónica**, Prentice-Hall,, 2001

Millmann, J., **Microelectrónica. Circuitos y sistemas analógicos y digitales**, Hispano Europea, 1988

Coughlin, R.F., Driscoll, F.F., **Amplificadores operacionales y circuitos integrados lineales**, Prentice-Hall, 1999

Recommendations

Subjects that continue the syllabus

Digital electronics and microcontrollers/V12G330V01601

Electronic instrumentation 1/V12G330V01503

Power electronics/V12G330V01701

Industrial electronics/V12G330V01924

Electronic instrumentation 2/V12G330V01921

Subjects that are recommended to be taken simultaneously

Automation and control fundamentals/V12G330V01401

Subjects that it is recommended to have taken before

Physics: Physics 1/V12G330V01102

Physics: Physics 2/V12G330V01202

Computer science: Computing for engineering/V12G330V01203

Mathematics: Calculus 1/V12G330V01104

Mathematics: Calculus 2 and differential equations/V12G330V01204

Basics of circuit analysis and electrical machines/V12G330V01303

Other comments

It is highly advisable that if the student wants to enroll into this subject, it has to be enrolled or has passed the subject of all previous quadesters, especially "Basics of circuit analysis and electrical machines" (V12G330V01303)

Individual communications will be made through the personal email address that appears in the moovi platform profile.

Students must inexcusably meet the deadlines established for the different activities.

In the different tests, students are advised to justify all the achieved results.

It is recommended, in the presentation of the various exercises, in the practice reports and in the exams, not to present misspellings and illegible characters or symbols, because they will affect the final score.

In the same way, the documentation that the students deliver must be done through word processing, spreadsheet, etc., but it is not valid to do it by hand and scan or photograph.

Hand notes cannot be used during the exams, and mobile phones must be turned off and put away at all times.