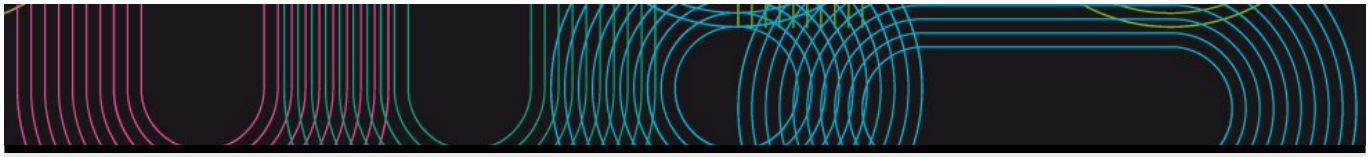

IDENTIFYING DATA				
Electronic technology				
Subject	Electronic technology			
Code	V12G363V01401			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	English			
Department				
Coordinator	Verdugo Mates, Rafael Soto Campos, Enrique			
Lecturers	Soto Campos, Enrique			
E-mail	esotoc@uvigo.es rverdugo@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The objective of this course is to provide the students with the theoretical and practical fundamental knowledge in electronics' five main areas: analog electronics, digital electronics, industrial sensors, power electronics and communications electronics. In case of any discrepancy between this translation of the guide and the Spanish version, the valid one is the Spanish version.			

Training and Learning Results	
Code	
B3	CG3 Knowledge of basic and technological subjects that enable students to learn new methods and theories, and to adapt to new situations.
C11	CE11 Knowledge of the fundamentals of electronics.
D2	CT2 Problem solving.
D9	CT9 Application of knowledge.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.

Expected results from this subject	Training and Learning Results		
Know the operation of the electronic devices.	B3	C11	D2 D9 D10
Know the electronic systems of conditioning and acquisition of data.		C11	D10
Identify the different types of industrial sensors.			D10
Know the digital electronic systems basic.		C11	D2 D9 D17
Know the electronic circuits for the communication of information.	B3		D10

Contents	
Topic	
Introduction	- Control and supervision of industrial systems by means of electronics - Some representative cases

Electronic devices, circuits and systems	- Electronics components and devices - Active and passive electronic devices - Analog and digital electronic circuits - Electronic systems
Diodes and rectification	- The diode - Operation modes and characteristics - Diodes types - Operation Models - Analysis of circuits with diodes - Rectifier circuits - Filtering for rectifier circuits - Thyristors
Transistors	- The Bipolar Junction Transistor (BJT.) Operation principles and characteristic curves - Work zones - Quiescent point design - The transistor operating as a switch - The transistor operating as an amplifier - Field Effect Transistors (FET).
Amplification	- Amplification concept - Feedback concept - The Operational Amplifier (OA) - Basic circuits with OA - The Instrumentation Amplifier
Digital Electronics I	- Numbering Systems - Boolean Algebra - Combinatorial logic functions. Analysis, synthesis and reduction
Digital electronics II	- Flip-flops - Sequential logic circuits - Programmable Systems - Microprocessors - Memories
Electronic Sensors	- Sensors - Types of sensors as function of the measuring magnitude - Some sensors of special interest in industry applications - Electrical model of some common sensors - Study of some examples of coupling sensors and CAD system
Analog - Digital Converters	- The Analog and Digital Signals. - The Analog to Digital Converter (ADC) - Sampling, quantification and digitization - More important ADC characteristics: number of bits, sampling speed, conversion range and cost
Industrial Communications	- Introduction to Industrial Communications - Industrial data buses.
Power Electronics	- Circuits for Power Conversion - Rectifiers - Lineal and Switched Power Sources

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	25	0	25
Problem solving	8	0	8
Previous studies	0	49	49
Autonomous problem solving	0	46	46
Laboratory practical	18	0	18
Objective questions exam	1	0	1
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
Lecturing	These sessions will be held in the rooms and dates fixed by the direction of the school. They will consist in an oral explanation by the professor of the most important parts of the course, all related with the materials that the student had to work previously. This is intended to favor the active participation of the students, that will have occasion to rise doubts and questions during the sessions. Active participation is desired during all the sessions.

Problem solving	During these sessions, in the classroom, interleaved with the lectures, the professor will proceed to solve examples and/or exercises that properly illustrate the problems to solve. As long as the number of participants in the classroom allows, active participation will be promoted.
Previous studies	Previous preparation of the theoretical sessions: Prior to the start of the theoretical sessions, the students will have available a series of materials that have to prepare, as the sessions will relay on them. Previous preparation of the laboratory sessions: It is mandatory that the students make all the assigned previous tasks prior to access the laboratory. These task are intended to greatly improve the laboratory knowledge acquisition. The achieved report will be taken into account when the laboratory session is to be evaluated.
Autonomous problem solving	Self study and review of the theoretical sessions for knowledge consolidation: The student must study, in a systematic time schedule, after each lecture session, in order to dissipate any doubts. Any doubts or unsolved questions will have to be expose to the professor as soon as possible in order to enhance the feedback of the learning process.
Laboratory practical	Laboratory sessions will be held in the time schedule established by the school's head teacher. Students will work in groups of two students each. The sessions will be supervised by a professor, who will control the assistance and will also evaluate the harnessing of it. During the laboratory sessionsthe students will make activities of the following kinds: - Assembling electronics circuits - Use of electronic instrumentation - Measure of physical variables on circuits - Do calculations related to the circuit and/or the measurements - Collect data and represent it (diagrams, charts, tables) At the end of each laboratory session each group will deliver the corresponding score sheets.

Personalized assistance

Methodologies	Description
Laboratory practical	Tutoring Sessions: During the established schedule of each professor, students will be able to speak freely about course issues with the professor. Also the will receive orientation and academic support, if needed. Email: The students also will be able to request orientation and support by means of email to the professors of the course. This way of attention is advisable for indications and short doubts of punctual type.

Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practical	Assessment of the laboratory sessions: The laboratory sessions will be evaluated in a continuous way, on each session. The applied criteria are: - A minimum attendance of 80% - Punctuality - Previous task preparation of the sessions - Make the most of the session The practical sessions will be held in groups of two students. The documents of the practices will be available prior to the sessions. The students will fill report, that will be delivered when the session ends. This report serves to justify both the attendance and how they have done the work asked for.	20		C11	D9 D10 D17
Objective questions exam	Several individual tests will be carried out referring to a set of subjects of the subject. None of the tests carried out will have a weight greater than 40% in the total grade for the subject.	80	B3	C11	D2 D9 D10
Essay questions exam	It will consist of an objective individual test where the entire content of the subject will be evaluated. It will be held at the end of the semester at the times established by the center's management. This test is reserved for those students who do not reach a minimum score in the "Objective question exams" or those who have been recognized by the center as waiving continuous assessment.	80	B3	C11	D2 D9 D10

Other comments on the Evaluation

EVALUATION AND GRADING OF THE SUBJECT

The evaluation of the subject is continuousand consists of the following elements:

Self assessment :

Associated with each topic there are severalself-assessment questionnaires. There are short questionnaires after each section or pill into which each topic is divided, and a larger and more comprehensive questionnaire at the end of each topic. These self-assessment questionnaires have no influence on the grade. The purpose of these questionnaires is to help students assess their level of knowledge about each of the topics. The answers of these questionnaires by the students provide valuable information to the teaching staff about those aspects of the subject in which the students find greater difficulties.

Laboratory sessions:

The evaluation of the laboratory sessions accounts for 20% of the course grade. The laboratory sessions are evaluated one by one, obtaining a grade for each session. The evaluation criteria are: attendance, punctuality, prior preparation and performance. The laboratory session grade (NP) will be obtained by averaging the grades of all the sessions, with the following requisites:

- A minimum attendance of 80% must be recorded, otherwise the laboratory grade will be zero.
- A minimum of 3.3 points in the grade of theory must be reached (NT), otherwise the laboratory grade will be zero.

Theory:

The evaluation of the theory part (NT) accounts for 80% of the course grade. For its evaluation, the subject will be divided into two parts (P1 and P2), each covering approximately 50% of the contents of the subject and three evaluation sessions will be held, distribute das follows:

First session: It will take place approximately in the middle of the semester. This session will exclusively evaluate P1.

Second session: It will be held on the date and time established by the center for the final exam in May. In this session each student will be able to take advantage of one of the following options:

- Incomplete option: Only P2 is examined. Students who have obtained a grade equal to or greater than 3.3 points in P1 may choose this option. If the grade obtained in P2 is equal to or greater than 3.3 points, the resulting grade will be NT = (P1 + P2) / 2. If the grade obtained in P2 is less than 3.3 points, NT will be calculated in the same way, but its maximum value will be limited to 3.6 points.
- Complete option: The student renounces the grade of P1 obtained in the first session and takes a complete exam (EC) of the entire theory. The grade will be NT = EC.

Third session: It will be done on the date and time established by the center for the final exam in July. In this session, the students will take a complete exam (EC). The grade will be NT = EC.

The final grade (NA) will be calculated asfollows: NA = 0.2x (NL) + 0.8x (NT)

Other considerations

For the present academic year, the laboratory qualifications of the two previous years will be kept and considered valid.

Those students to whom the management of thecenter grants the waiver of continuous evaluation will be evaluated, on the same day and time of the final exam established by the center (second and / or third session). The evaluation will consist of two tests: An exam in full modality (EC) with a weight of 80% on the final grade. A specific laboratory test, weighing 20% on the final grade. In principle, this specific test will be carried out after the written test in the electronic laboratories of the corresponding center's site.

In the extraordinary call End of Degre estudents will take a theory exam that will have a weight of 80% on the final grade. The remaining 20% will be obtained from the qualification of aspecific laboratory test.

To pass the course, in any of the previous cases, it is necessary to achieve a final grade equal or higher than 5 points.

Recommendations:

It is very important that the students keep updated the profile in the FAITIC platform. All communications related with this course will be made through this platform. All individual communications will be made through the email listed in this platform.

The students can solve doubts related with the laboratory previous activities in the personal attention hours (tutoring time), or by any other contact procedure available in FAITIC.

The students must meet the deadlines for all the activities.

All the achieved results must be justified, in any of the exams or activities. None of the achieved results will be taken for good if no explanation is given about the method used to find them. The selected method for solving a problem is considered when grading the solution.

When writing the solutions and answers in reports and tests, avoid spelling mistakes and unreadable symbols.

Exams lacking some of the sheets will not be graded.

Use of cell phones, notes or books is forbidden during exams.

Competencies Acquisition and Its Influence on Assesments

In this subject all the different activitiesare designed to assess the students in the competencies, and the acquisition ofthe competencies defines the final mark. Here follows a description of how thecompetencies and activities are related.
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.
The acquisition of this competency is providedby the contents of the topics of the subject. All activities ofself-assessment, the laboratory sessions and the different test are elaborated to evaluate the knowledge of the technical subjects.
CE11 Knowledge of the fundamentals ofelectronics.
This competency is warrant to be acquired along all the lectures, the laboratory sessions, the self-assessment activities andt he tests.
CT2 Problems resolution.
The students will exercise this competency by means of the following activities: self-assessment activities, bulletin of problems and previous theoretical solution of experiments to be made at the laboratory. This competency is also acquired along all thetest (for each block and the individual one), as they mainly are composed by problems to be solved.
CT9 Apply Knowledge
This competency is mainly acquired during the laboratory sessions, where the theoretical knowledge from problems, designs and simulations should match the assembly of circuits and real measures. Laboratory sessions are evaluated one by one, scoring an average of marks, if there is a minimum number of attended sessions with a minimum score.
CT10 Self learning and work
The self learning process is fundamental to achieve the score to approve the subject. In order to motivate students in the task of acquiring the theoretical knowledgeneed, self-assessment test (on line), lectures based on the remote learningplatform (faitic) and bulletins of problems have been created. Theself-assessment test also provide feedback to the professors about the main difficulties found by students. On thelaboratory sessions, the previous preparation is an explicit method of evaluation. In order to made this preparation, each of the laboratory sessions has its specific documentation and tutorials.
CT17 Working as a team
The students exercise this competency at the laboratory sessions, by making teamsof two people. Cooperation in most of the sessions is needed to perform the assembly of circuits, make the measurements and take notes. The professor in charge of the laboratory session verifies the previous work and how each session is going along, watching that both members cooperate to achieve the best possible result. Scores for students can be different if the professor detects that one of the team member is not cooperating.

Sources of information

Basic Bibliography

Malvino, Albert; Bates, David J., **Principios de Electrónica**, 7ª,

Boylestad, R. L.; Nashelsky, L., **ELECTRÓNICA: TEORIA DE CIRCUITOS Y DISPOSITIVOS ELECTRONICOS**, 10ª,

Rashid, M.H., **CIRCUITOS MICROELECTRONICOS: ANALISIS Y DISEÑO**, 2ª,

TOCCI, RONALD J., NEAL S. WIDMER , GREGORY L. MOSS, **Sistemas digitales. Principios y aplicaciones**, 10ª,

Lago Ferreiro, A.; Nogueiras Meléndez, A. A., **Dispositivos y Circuitos Electrónicos Analógicos: Aplicación práctica en laboratorio**,

Complementary Bibliography

Malik N. R., **Electronic Circuits. Analysis, simulation, and design**,

Wait, J.; Huelsman, L.; Korn, G., **INTRODUCCION AL AMPLIFICADOR OPERACIONAL**, 4ª,

Pleite Guerra, J.; Vergaz Benito, R.; Ruíz de Marcos; J. M., **Electrónica analógica para ingenieros.**,

Recommendations

Subjects that are recommended to be taken simultaneously

Fundamentals of automation/V12G380V01403

Subjects that it is recommended to have taken before

Physics: Physics I/V12G380V01102
Physics: Physics II/V12G380V01202
Mathematics: Algebra and statistics/V12G380V01103
Mathematics: Calculus I/V12G380V01104
Mathematics: Calculus II and differential equations/V12G380V01204
Fundamentals of electrical engineering/V12G380V01303