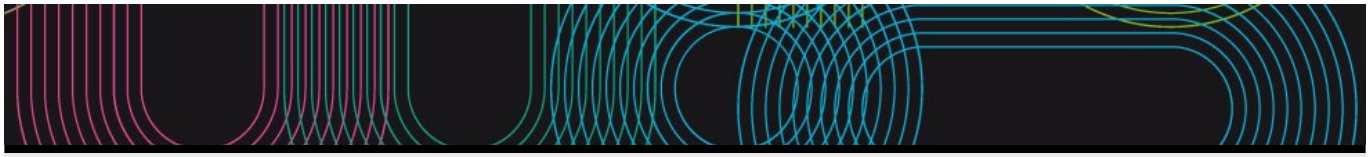

IDENTIFYING DATA				
Electronic Systems for Digital Communications				
Subject	Electronic Systems for Digital Communications			
Code	V05G300V01623			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish Galician			
Department	Electronics Technology			
Coordinator	Machado Domínguez, Fernando			
Lecturers	Machado Domínguez, Fernando Mariño Espiñeira, Perfecto			
E-mail	fmachado@uvigo.es			
Web	http://faitic.uvigo.es			
General description	The overall objective of this course is to provide the theoretical and practical skills for the analysis and design of electronic systems for digital communications. To achieve this, several wire and wireless communication standards will be reviewed and the basic architectures of digital communication systems, the design of the electronic circuits that compose these systems and their functionality will be studied.			

Competencies	
Code	
B11	CG11 To approach a new problem considering first the essential and then the secondary aspects
B13	CG13 The ability to use software tools that support problem solving in engineering.
C40	(CE40/SE2): The ability to select electronic circuits and devices specialized in transmission, forwarding or routing, and terminals for fixed and mobile environments.

Learning outcomes		
Expected results from this subject		Training and Learning Results
Knowledge of transmission-reception principles and general considerations on the transmission-reception (transceivers) and routing circuits.		C40
Knowledge of the basic digital communication systems architecture and the functional design of these systems.	B11	C40
Ability to design different basic subcircuits that compose the transmision-reception circuits of a digital communication system.	B11 B13	C40
Ability to evaluate the possibilities of diferent interconnection standards for the design of communications systems.		C40
Knowledge of the terminals used in digital communications systems.		C40

Contents	
Topic	
Unit 1. Introduction	Introduction and review of the basic concepts of transmission-reception and general considerations on the transmission-reception circuits. Basic architecture of digital communications systems. Different hardware and software implementations: ASIC, DSP and FPGA.
Unit 2. Wired communication systems	Introduction to serial communication systems. Transmission media, signals and bit encoding. Transceiver circuits. Medium access methods.
Unit 3. Asynchronous serial communication systems	Asynchronous serial communication protocols. Standards and practical implementations.

Unit 4. Synchronous serial communication systems	Synchronous serial communication protocols. Standards and practical implementations.
Unit 5. High-speed synchronous serial communication systems	High-speed synchronous serial communication protocols. Differential technologies. Standards and practical implementations.
Unit 6. Wireless communication systems	Wireless communication protocols. Wiireless networks characteristics and configurations.
Unit 7. Short range wireless communication systems	Wireless communication protocols of short range and low consumption. WPAN Networks. Characteristics and analysis of the wireless sensors networks. Standards and practical implementations.
Unit 8. Radio frequency identification systems. Near-field communications	RFID technology. Near-field communications. Standards and practical implementations.

Laboratory	
Block 1. Wired asynchronous serial communication circuits	Design, implementation and test of an asynchronous serial communication circuit. Transceivers.
Block 2. Wired synchronous serial communication circuits	Design, implementation and test of a synchronous serial communication circuit. Clock recovery.
Block 3. Wireless communication circuits	Design, implementation and test of a wireless communication circuit. Using and configuring communication modules.
Block 4. Project: Design and implementation of a digital communications system	Design, implementation and test of a digital communication system. Applying theoretical and practical concepts.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	12	24
Problem solving	4	4	8
Laboratory practices	8	20	28
Project based learning	15	60	75
Objective questions exam	1.5	6	7.5
Problem solving	1.5	6	7.5

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

Methodologies

	Description
Lecturing	The lecturer will explain in the classroom the main contents of the subject. The students have to manage the proposed bibliography to carry out a self-study process in a way that leads to acquire the knowledge and the skills related to the subject. The lecturer will answer the students questions in the classroom or in the office. In these sessions the students will develop the skills CE40 and CG11 ("know").
Problem solving	Activities designed to apply the main concepts of the subject to solve problems and exercices. The lecturer will explain a set of problems and the students have to solve diferent take-home sets of problems. The lecturer will answer the students questions in the classroom or in the office. In these sessions the students will develop the skill CE40 ("know").
Laboratory practices	Activities designed to apply the main concepts and definitions of the subject. The student will be asked to acquire the basic skills to manage the laboratory instrumentation, software tools and components in order to construct and test electronic circuits. The student has to develop and demonstrate autonomous learning and collaborative skills. Possible questions can be answered in the laboratory sessions or in the lecturer's office. In these sessions the students will develop the skills CE40 and CG13 ("know how").
Project based learning	Students have to develop a group project that goes on over a period of time and addresses a specific problem. They have to design, schedule and carry out a set of tasks to achieve a solution. Each group will present the proposed solution and a project report. In these sessions the students will develop the skills CE40, CG11 and CG13 ("know how").

Personalized attention

Methodologies	Description
Lecturing	The lecturer will answer the students questions and also give instructions to guide the studying and learning process. The students can go to the lecturer's office. The timetable will be available on the subject website at the beginning of the term.
Problem solving	The lecturer will answer the students questions and also give instructions to guide the studying and learning process. The students can go to the lecturer's office. The timetable will be available on the subject website at the beginning of the term.

Laboratory practices	The lecturer will answer the students questions and also give instructions to guide the studying and learning process. The students can go to the lecturers office. The timetable will be available on the subject website at the beginning of the term.
Project based learning	The lecturer will answer the students questions and also give instructions to guide the studying and learning process. The students can go to the lecturers office. The timetable will be available on the subject website at the beginning of the term.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practices	The lecturer will check the level of compliance of the students with the goals related to the laboratory skills. The final mark of laboratory, FML, will be assessed in a 10 points scale. For the evaluation of the laboratory sessions, the lecturer will assess the group work (the same mark for each member), the individual preliminary tasks and the answers to personalized questions for each session.	20	B13 C40
Project based learning	The lecturer will consider the results and the quality of the analysis performed in the developed project. The group project mark (GPM) will be assessed in a 10 points scale. For the evaluation of the project, the lecturer will assess the group work (the same mark for each member) and the individual oral presentation of the developed project.	50	B11 B13 C40
Objective questions exam	The lecturer will check the level of compliance of the students with the goals related to the theory skills. The final mark of theory, FMT, will be assessed in a 10 points scale.	15	C40
Problem solving	The lecturer will check the level of compliance of the students with the goals related to the theory skills. The final mark of theory, FMT, will be assessed in a 10 points scale.	15	C40

Other comments on the Evaluation

1. Continuous assessment (first call)

According to the guidelines of the degree and the agreements of the academic commission, a continuous assessment learning scheme will be offered to the students.

When the students perform a short answer test or attend at least two laboratory sessions, ***they will be assessed by continuous assessment***.

The subject comprises three different parts: theory (30 %), laboratory (20%) and group project (50%). Once a task has been assessed, the students can not do/repeat the task at a later date. The marks are valid only for the current academic course.

1.a Theory

Two short answer tests (SAT) are scheduled. The first intermediate test (SAT1) will be performed during the classes. The scheduling of the intermediate test will be approved by the Academic Committee of the Degree (CAG) and will be available at the beginning of the semester. The second test (SAT2) will be performed during the examination period in the date specified in the academic calendar. Marks for each test will be assessed in a 10 points scale. The minimum mark required to pass this part is of 4 (SATi>=4). The final mark of theory (FMT) is calculated as the arithmetic mean of the individual marks:

FMT = (SAT1 + SAT2)/2

The students cannot do the tests at a later date.

If the minimun mark in the first test is not achieved (SAT1 less than 4), the students can repeat this part in the same date of the second test.

1.b Laboratory

Four laboratory sessions are scheduled. Each session lasts approximately 120 minutes and the students will work in groups. This part also will be assessed by continuous assessment. The lecturer will consider the work of the students carried out before the laboratory session to prepare the proposed tasks, the work in the laboratory to deal with them as well as the students behavior.

Marks for each laboratory session (LSM) will be assessed in a 10 points scale. In order to pass the laboratory part the students can not miss more than one laboratory sessions. The final mark of laboratory (FML) is calculated as the arithmetic mean of the individual laboratory session marks:

$$FML = (LSM1 + LSM2 + LSM3 + LSM4)/4$$

1.c Group project

In the first session lecturer will present the objectives and the schedule of the project. They also assign a specific project to each group. After that, the most important part of the workload will be developed in the laboratory. Six hours of B laboratory sessions and six hours of C laboratory sessions. In order to assess the project, the lecturer will consider the results, their analysis and presentation, and the quality of the written report. The group project mark (GPM) will be assessed in a 10 points scale. The students are only allowed to miss one project session. The minimum mark required to pass this part is of 4 (GPM>=4).

1.d Final mark of the subject

The weighted points from all assessed parts are added together to calculate the final mark (FM). The following weightings will be applied: 30% theory (FMT), 20% laboratory (FML) and 50% group project (GPM). In order to pass the subject, students will be required to pass the theory, laboratory and group project parts. In this case the final mark (FM) will be:

$$FM = (0.3 \cdot FMT + 0.2 \cdot FML + 0.5\ GPM)$$

However, when the students do not pass both parts (FMT or GPM less than 4) or do not reach the minimum mark of 4 required to pass each short answer test or miss more than 1 laboratory sessions or miss more than 1 project sessions, the final mark will be:

$$FM = (0.3 \cdot FMT + 0.2 \cdot FML + 0.5\ GPM) \cdot 3.5/7$$

A final mark higher than five points (FM >= 5) should be achieved in order to pass the subject.

2. Eventual assessment (first call)

The students who prefer a different educational policy can attend an exam on a scheduled date. This assessment will comprise three parts (similar to the activities completed by the continuously assessed students): theory exam, laboratory exam and project.

The theory exam will be assessed in a 10 points scale. The minimum mark required to pass this part is of 4 (FMT>=4).

The laboratory exam will be assessed in a 10 points scale. The minimum mark required to pass this part is of 4 (FML>=4).

The project will be assessed in a 10 points scale. The project will be assigned following the procedure described in advance by the lecturer. The student will prepare a written report to be handed in just before the exam. The final project must be presented within one week of delivery of reports. The minimum mark required to pass this part is of 4 (GPM>=4).

In order to pass the subject, students will be required to pass each part (FMT>=4, FML>=4 and GPM>=4). In this case the final mark (FM) will be:

$$FM = (0.3 \cdot FMT + 0.2 \cdot FML + 0.5\ GPM)$$

However, when the students do not reach the minimum mark of 4 required (FMT or FML or GPM less than 4), the final mark will be:

$$FM = (0.3 \cdot FMT + 0.2 \cdot FML + 0.5\ GPM) \cdot 3.5/7$$

A final mark higher than five points (FM >= 5) should be achieved in order to pass the subject.

3. Second call assesment and extraordinary call assesment

The assessment policy in these calls will follow the scheme described in the previous section. Dates will be specified in the academic calendar. This exam consist on a theory exam, a laboratory exam and a project. In order to attend the laboratory exam and to assign the project, the students have to contact to the lecturer according to an established procedure. The procedure will be published in advance.

In second call assestment, the marks obtainedin the first chance assesment, continuous assessment or semester assessment, are kept for those parts in which the student has not attended. The final mark will be calculated as it has described in section 2.

Sources of information

Basic Bibliography

F. Machado, V. Pastoriza, F. Poza, **Sistemas Electrónicos para Comunicaciones Digitales**, Curso 2016/2017,

P. Mariño, **Las comunicaciones en la empresa. Normas, redes y servicios**, 2ª Ed.,

S. Mackay, E. Wright, D. Reynders, J. Park., **Practical industrial data networks : design, installation and troubleshooting**, 1ª Ed.,

Complementary Bibliography

R. Faludi, **Building wireless sensor networks**, 2011,

H. Lehpamer, **RFID design principles**, 2012,

B. Sklar, **Digital communications. Fundamentals and applications**, 2ª Ed.,

Recommendations

Subjects that are recommended to be taken simultaneously

Data Acquisition Systems/V05G300V01521

Subjects that it is recommended to have taken before

Digital Electronics/V05G300V01402
Programmable Electronic Circuits/V05G300V01502