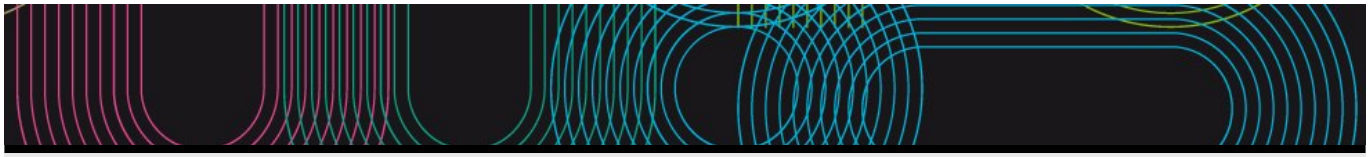

IDENTIFYING DATA				
Electronic Systems for Digital Communications				
Subject	Electronic Systems for Digital Communications			
Code	V05G301V01318			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Machado Domínguez, Fernando			
Lecturers	Machado Domínguez, Fernando			
E-mail	fmachado@uvigo.es			
Web	http://moovi.uvigo.gal			
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.			

Training and Learning Results	
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.

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	Laboratory sessions and project.
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 practical	8	20	28
Project based learning	15	45	60
Report of practices, practicum and external practices	0	15	15
Objective questions exam	1.5	6	7.5
Problem and/or exercise 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 C40 and B11 ("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 C40 ("know").
Laboratory practical	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 C40 and B13 ("know how").
Project based learning	Students have to develop a group project, as long as it is possible to form groups, 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 C40, B11 and B13 ("know how").

Personalized assistance

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 (individually or in a group). The timetable will be available on the school website at the beginning of the term. The timetable and/or the mechanism to request tutoring sessions will be available on the subject's website on the Moovi online-teaching portal (https://moovi.uvigo.gal/).
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 (individually or in a group). The timetable will be available on the school website at the beginning of the term. The timetable and/or the mechanism to request tutoring sessions will be available on the subject's website on the Moovi online-teaching portal (https://moovi.uvigo.gal/).

Laboratory practical	The lecturer will help students understand the work to be developed in the laboratory (components, circuits, instrumentation and tools). The students can go to the lecturer□s office (individually or in a group). The timetable will be available on the school website at the beginning of the term. The timetable and/or the mechanism to request tutoring sessions will be available on the subject's website on the Moovi online-teaching portal (https://moovi.uvigo.gal/).
Project based learning	The lecturer will be available to help students in order to deal with the project. The timetable will be available on the school website at the beginning of the term. The timetable and/or the mechanism to request tutoring sessions will be available on the subject's website on the Moovi online-teaching portal (https://moovli.uvigo.ga/).

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	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), as long as it was possible to form groups, the individual preliminary tasks and the answers to personalized questions for each session.	20	B13 C40
Project based learning	The lecturers will consider the work done during the laboratory sessions, the presentation of results and functionality. This mark (FUN) will be assessed in a 10 points scale and will represent 80% of the group project mark and 40% of the final mark of the subject. For the evaluation of the project, the lecturer will assess the group work (the same mark for each member) and the individual work during the laboratory sessions and the presentation of the developed project.	40	B11 B13 C40
Report of practices, practicum and external practices	The lecturers will consider the quality of the project report and the presentation and analysis of the results. This mark (REP) will be assessed in a 10 points scale and will represent 20% of the final mark project and 10% of the final mark of the subject. For the evaluation of this part, the lecturer will assess the group work (the same mark for each member) and the individual presentation of the developed project.	10	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 and/or exercise 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 (ordinary 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 the first short answer test or attend any laboratory sessions one month after the start of the semester, **they will be assessed by continuous assessment**.*The final grade of students who have chosen this path cannot be "not presented".

The subject comprises three different parts: theory (30 %), laboratory (20%) and group project (50%). The marks of the assessed tasks are valid only for the current academic course.

The planning for the different sessions will be available at the beginning of the semester. Students who are occasionally unable to attend any of the assessment tasks could repeat it, whenever it was possible within the subject academic schedule and only if the absence is duly justified.

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 student□s 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.

1.c Project

In the first session lecturers will present the objectives and the schedule of the project. They will also assign a specific project to each group, as long as it was possible to form groups. After that, the most important part of the workload and the project supervision will be developed in the remaining sessions: six hours of B laboratory sessions and six hours of C laboratory sessions.

In order to assess the project, the lecturer will consider: the work done during the laboratory sessions, functionality and presentation of results (FUN), and the quality of the project report (REP). Each of these parts will be scored on a 10 points scale. The group project mark (GPM) will be the weighted sum of the marks for each part:

GPM = 0.8·FUN + 0.2·REP

The project will be assessed in a 10 points scale. The minimum mark required to pass this part is of 4 (GPM>=4). The students are only allowed to miss one project session and only if this absence is duly justified.

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·FMT + 0.2·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 grade can never be higher than 4.9:

FM = min{4.9 ; (0.3·FMT + 0.2·FML + 0.5 GPM)}.

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

2. Global assessment (ordinary call)

The students who prefer a different educational policy can attend an exam on a scheduled date. The date will be specified in the academic calendar. This exam will comprise three parts: theory exam, laboratory exam and project. The student will prepare a written project report to be handed in just before the exam. The final project must be presented within one week of delivery of reports. In order to assign the project, the student has to contact to the lecturer at least four weeks before the exam.

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).

In order to assess the project, the lecturer will consider the results and the quality of the written report. The project will be

assessed in a 10 points scale. 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·FMT + 0.2·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 can never be higher than 4.9:

FM = min{4.9 ; (0.3·FMT + 0.2·FML + 0.5 GPM)}.

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

3. Extraordinary call and end-of-program call

The assessment policy in extraordinary call and end-of-program call 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 assign the project, the student has to contact to the lecturer at least four weeks before the exam.

The final mark will be calculated as it has described in section 2.

In extraordinary call, the marks obtained in the previous continuous or global assessment are kept for those parts in which the student has not attended.

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 continue the syllabus
Industrial Communications/V05G301V01410

Subjects that it is recommended to have taken before
Digital electronics/V05G301V01203
Programmable Electronic Circuits/V05G301V01302