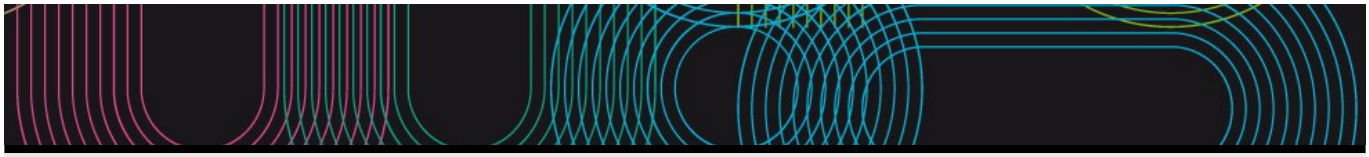

IDENTIFYING DATA				
Electronic communication systems				
Subject	Electronic communication systems			
Code	V12G330V01922			
Study programme	Grado en Ingeniería en Electrónica Industrial y Automática			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Soto Campos, Enrique			
Lecturers	Soto Campos, Enrique			
E-mail	esotoc@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim of this subject is to teach the basis of the theory of communications, in particular of the digital communications and of the electronic systems used in them. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Skills	
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.
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the scope of industrial engineering in the field of Industrial Electronic and Automation.
C21	CE21 knowledge of the fundamentals and applications of digital electronics and microprocessors.
D2	CT2 Problems resolution.
D3	CT3 Oral and written proficiency.
D9	CT9 Apply knowledge.
D17	CT17 Working as a team.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Knowledge of basic communications theory.	B3	C21	D2 D3 D9
Knowledge of the foundations of the digital communications.	B3	C21	D2 D3 D9
Knowledge of the most common and important considerations of the digital communications processes.		C21	D2 D3 D9
Knowledge of the hardware implementations of a digital communications system.	B4	C21	D2 D9 D17
Understanding of how the general theory applies to communications buses for industrial applications.	B4		D3 D9 D17

Contents	
Topic	
1. Introduction to communications systems	Elements of a communication system. Electromagnetic spectrum. Time and frequency domain. Noise and communications.
2. Introduction to digital communications systems	Systems classification. Sampling. Quantification. PCM.
3. The ISO OSI standard	Definitions. Justification. OSI Levels.
4. Physical layer: transmission media	Wires and categories. Microwaves links. Satellite channels. Optical fibre.
5. Physical layer: base band modulation	Definitions. Digital standards. Base band modulations. Classification. Clock recovery. Spectrum. AC coupling. Error protection. Trasparency.
6. Physical layer: pass band modulation	Analog standards. Electrical attributes. Pass band modulations: in amplitude, phase and frequency.
7. Physical layer: parallel standards	Parallel port. GPIB BUS.
8. Data link layer: Functions	Definitions. Frame synchronisation and trasparency.
9. Data link layer: transmission error control	Error control codes. Block codes. Linear group codes. Cyclic codes. Convolutional codes: Viterbi algorithm .
10. Data link layer: Coordination of the communication	Centralised. Contention.
11. Data link layer: sharing of the physical circuit	Static allocation: Multiplexing. Dynamic allocation: Distributed. Random access. Regulated access. Spread spectrum systems.
12. Data link layer: failure recovery and flow control	Mechanisms of failure recovery. Protocols of flow control.
13. Data link layer: Protocols	Character oriented protocols: ASCII. Bit oriented protocols: HDLC.
14. Hierarchy of communications in the industry	CIM. Examples. Field buses.
15. Security in industrial communications.	Introduction. Threats classification. Protection measures.
16. Wide-band Networks	Convergence of data and voice networks. ATM. DSL.
17. Analog communications	AM. FM. Television.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	21	31.5	52.5
Mentored work	4.5	18	22.5
Problem solving	5	7.5	12.5
Previous studies	0	22.5	22.5
Autonomous problem solving	0	20	20
Laboratory practical	18	0	18
Problem and/or exercise solving	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Most important aspects of the subjetc will be explained, looking for the active participation of the student posing questions that has to resolve in class.
Mentored work	These assigments look for the student to apply the exposed basic theory in class to real systems and in this way understand this theory and how is put in practice. They will make it in groups to boost team work. They will be presented in class.
Problem solving	The students will resolve in class with the help of the professor exercises of application of the theory.
Previous studies	Preparatory work masterclass: the student has to read the subject previously to be able to pose any doubts that arise to the professor. Preparatory work resolution problems: the student has to at least have tried to resolve the problems proposed to understand better their resolution. Preparatory work laboratory: the student has to read and prepare the practice previously for his correct undestanding.
Autonomous problem solving	With the aim of checking the success of the learning process, the student will have at his disposal bulletins of problems to resolve on their own.
Laboratory practical	Laboratory practices will be done on Promax EC-796 systems, trainers of digital communications, where they will see in practice digital communications systems.

Personalized assistance	
Methodologies	**Description**
Laboratory practical	In tutoring hours doubts on the approach of the practices will be attended. During the practices themselves help will be available to any difficulty that arise on the set up as long as the answer to the doubt is not answered in the documentation or in the practice.

Lecturing	In tutoring hours any doubts on the already exposed subject in the master session will be resolved.
Mentored work	In tutoring hours support and orientation for the assignments will be provided. It includes support on the content and on the form of the assignment.
Problem solving	In tutoring hours possible doubts on the resolution of problems will resolved.
Tests	**Description**
Problem and/or exercise solving	During the short answer test only doubts of clarification will be answered.

Assessment

	Description	Qualification	Training and Learning Results		
Mentored work	Presentation of the assignment: description of an applied communication system. The fulfillment of this task is a requirement to obtain a pass.	30		C21	D2 D3 D9 D17
Problem solving	The participation in class with the resolution of problems will be valued.	5	B4	C21	D2 D3 D9
Laboratory practical	The realization of all the tasks of each practice will be graded in function of their fulfillment. The evaluation criteria are: minimum attendance of an 80%, punctuality, previous preparation, fulfillment and results.	20		C21	D3 D9 D17
Problem and/or exercise solving	This test will be performed on the date of the final exam. It is conceived to check the basic knowledge of the subject.	45		C21	D2 D3 D9

Other comments on the Evaluation

The student must obtain a minimum of 5 over 10 in each of the parts: laboratory practices, classroom work and short answer test, to obtain a pass qualification in the subject.

Optionally assignments can be done in English.

Students who waive the continuous assessment must pass a written test more extensive than that of the minimum knowledge applied to the rest.

It is expected that the student will have an adequate ethical behaviour. If a non-ethical behaviour is detected (copy, plagiarism, utilization of unauthorized electronic devices, for example), it will be considered that the student does not fulfill the necessary requirements to pass the subject. Depending of the kind of the non ethical behaviour detected, it could be concluded that the student has not fulfilled the competences B2, B3 and CT19.

Sources of information

Basic Bibliography

J. S. Beasley, J. D. Hymer, Gary M. Miller, **Electronic Communications: A System Approach**, 1, Pearson, 2014

Complementary Bibliography

Ian Glover, Peter M. Grant, **Digital Communications**, 3, Prentice Hall, 2009

Roy Blake, **Electronic Communications Systems**, 2, Delmar Thomson Learning, 2001

Carl Nassar, **Telecommunications Demystified: A Streamlined Course in Digital Communications (and Some Analog) for EE Students and Practicing Engineers**, 1, LLH Technology Publishing, 2001

Roy Blake, **Sistemas electrónicos de comunicaciones**, Mexico, D.F. : International Thomson, 2004

Recommendations

Subjects that continue the syllabus

Digital electronics and microcontrollers/V12G330V01601

Subjects that are recommended to be taken simultaneously

Digital electronic systems/V12G330V01923

Subjects that it is recommended to have taken before

Fundamentals of electronics/V12G330V01402
Basics of circuit analysis and electrical machines/V12G330V01303
Digital electronics and microcontrollers/V12G330V01601

Other comments

To enrol in this subject it is necessary to have passed or at least be enrolled in all the subjects of the previous courses to the course in that this subject is located.
In particular, those students who have not studied successfully the subject 'Electrónica Digital y Microcontroladores' will find themselves unable to follow this subject.

Contingency plan

Description

The contents and the learning results should not be modified in order to guarantee that they are in accordance to the memories of the degree. An attempt should be made to adjust the materials, tutorials and teaching methodologies to try to achieve these results. This is an aspect of great importance for the realization of the accreditation processes to which the different degrees are subjected. The contingency plan must be based on a development of the subject, adapting the methodologies and materials, in the search of the fulfillment of the learning results of all the students.

The teaching methodologies will be adapted to the telematic means that are available to the teaching staff, in addition to the documentation provided through Moovi and other teaching platforms, email, etc.

When face-to-face teaching is not possible, to the extent possible, the teaching of theoretical content by telematic means will prevail as well as those content of problem-solving practices, computer room, and others, which can be virtualized or developed by the students in a guided manner, trying to maintain presence for the experimental laboratory sessions, provided that the groups comply with the regulations established at the time by the pertinent health and safety authorities. In the case of not being able to be taught in person, those non-virtualizable contents will be taught or supplied by others (guided autonomous work, etc.) that also allow them to achieve the skills associated with them. The tutorials may be carried out indistinctly in person (whenever it is possible to guarantee sanitary measures) or telematics (e-mail and others) respecting or adapting the scheduled tutorials. In addition, a methodological adaptation will be made to students at risk, providing them with additional specific information, if it is proven that they cannot have access to the content taught in a conventional way.

Additional information on the evaluation: those tests that have already been carried out electronically will be kept and, as far as possible, the face-to-face tests will be kept, adapting them to current health regulations. The tests will be carried out in person, except for the Rectoral Resolution that indicates that they must be done in a non-face-to-face way, being carried out by means of the different tools available to the teaching staff. Those tests that cannot be carried out electronically will be supplied by others (deliveries of guided autonomous work, etc.)