Universidade de Vigo

IDENTIFYING DATA
Electronic communication systems

Subject	Electronic communication systems				
Code	V12G330V01922				
Study programme	Degree in Industrial Electronics and Automation Engineering				
Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Optional	4th	1st
Teaching language	Spanish				
Department					
Coordinator	Soto Campos, Enrique				
Lecturers	Soto Campos, Enrique				
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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.				

Competencies

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 in the own language.
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. Wide-band Networks	Convergence of data and voice networks. ATM. DSL.
16. Analog communications	AM. FM. Television.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	21	31.5	52.5
Classroom work	4.5	18	22.5
Troubleshooting and / or exercises	5	7.5	12.5
Previous studies / activities	0	22.5	22.5
Autonomous troubleshooting and / or exercises	0	20	20
Laboratory practises	18	0	18
Short answer tests	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
Master Session	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.
Classroom 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.
Troubleshooting and / or exercises	The students will resolve in class with the help of the professor exercises of application of the theory.
Previous studies / activities	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 troubleshooting and / or exercises	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 practises	Laboratory practices will be done on Promax EC-796 systems, trainers of digital communications, where they will see in practice digital communications systems.

Personalized attention

Methodologies	Description
Laboratory practises	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.

Master Session	In tutoring hours any doubts on the already exposed subject in the master session will be resolved.			
Classroom 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.			
Troubleshooting and / or exercises	In tutoring hours possible doubts on the resolution of problems will resolved.			
Tests	**Description**			
Short answer tests	During the short answer test only doubts of clarification will be answered.			

Assessment

	Description	Qualification	Training and Learning Results		
Master Session	The participation in class with comments and questions will be valued.	5	B3	C21	D2 D3 D9
Classroom 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
Troubleshooting and / or exercises	The participation in class with the resolution of problems will be valued.	5	B4	C21	D2 D3 D9
Laboratory practises	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
Short answer tests	This test will be performed on the date of the final exam. It is conceived to check the basic knowledge of the subject.	40		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.