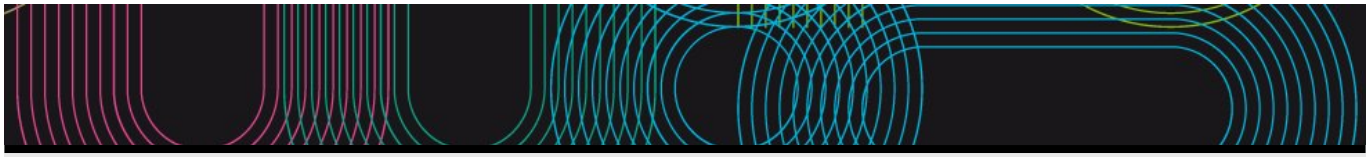

IDENTIFYING DATA				
Industrial Communications				
Subject	Industrial Communications			
Code	V05G301V01410			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Domínguez Gómez, Miguel Ángel			
Lecturers	Domínguez Gómez, Miguel Ángel			
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General description	There are more electronic units of control in the systems used in diverse areas of the engineering (industrial control, automotion, domotic, aircrafts, ships, etc.). These units must be connected between them of an efficient way and in real time to transmit all the necessary information. The use of industrial communications networks has had a very big peak in the last years and the knowledge of the different fieldbus protocols existing in the market is of big interest for the engineering. This subject intends that the student know the different protocols of communications that exist in various areas of application and acquires the capacity to choose the most adapted solution for a determinate problem. In accordance with the exposed, will treat the following contents: * Introduction to industrial communications systems * Introduction to fieldbuses * Standards * General Characteristics * Applications * Study of the most used protocols * Tools of design and analysis			

Training and Learning Results	
Code	
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
B14	CG14 The ability to use software tools to search for information or bibliographical resources.
C64	(CE64/OP7) Comprehension and command of basic concepts of industrial communication networks of field buses.

Expected results from this subject		Training and Learning Results
Understanding and control of the industrial communication systems.		C64
Understanding and control of the basic concepts of industrial communications networks (fieldbuses).		C64
Understanding and control of fieldbuses applications and the most important protocols.		C64
Capacity to choose the better solution for a determinate problem of communication.	B6	C64
Capacity to design simple industrial communication systems.	B6 B14	
Basic knowledges of software tools for analysis and design.	B6 B14	
Capacity of use and configurate communication hardware modules.	B6 B14	

Contents

Topic	
Theme 1: Communication networks	OSI and TCP/IP models. Local Area Networks (LAN). Wide Area Networks (WAN). Wireless and mobile communication systems. Interconnection resources. Hierarchy.
Theme 2: Fieldbuses	Origin. Main characteristic. standardization. Applications.
Theme 3: CAN/LIN	History. Applications. Main characteristic. Physical layer. Data link layer. Media access control. Frames format. Coding of frames. Errors management.
Theme 4: CAN controller MCP2515	Features. Device overview. Message transmission and reception. Timing configuration. Error detection. Interrupts. Modes of operation.
Theme 5: Domotic fieldbuses: KNX	Basic concepts (domotic, inmotic, digital home). Physical levels of transmission. Main protocols used in domotic. KNX (Generalities, main characteristic, topology, telegram).
Theme 6: PROFIBUS	Physical layer. Topology. Data link layer. Media access control. Transmission methods. Timers. Structure of the frames.
Theme 7: WorldFIP	Physical layer. Data link layer. Variables and messages. Media access control. Frames format. Timers. Bus arbitrator. Producers/Consumers entities.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	4	8	12
Lecturing	12	36	48
Mentored work	15	52	67
Laboratory practical	6	12	18
Essay questions exam	5	0	5

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

Methodologies

	Description
Introductory activities	Presentation of the course. Presentation of the laboratory practices and the instrumentation and software to use. Through this methodology the competencies CG6, CG14 and CE64 are developed.
Lecturing	Exhibition by professor of the contents. Personal homework of the student reviewing the concepts seen in the classroom and preparing the topics using the proposed bibliography. Identification of doubts that require to be resolved in personalised attention.Through this methodology the competencies CG6, CG14 and CE64 are developed.
Mentored work	A work about a specific protocol will be assigned to the students, individually or in group. This work will have to be exposed and argued in class.Through this methodology the competency CG14 is developed.
Laboratory practical	Activities of application of the theoretical knowledges purchased. It will learn to handle specific software of design, simulation and analysis of industrial communication networks. They will program simple hardware modules of some protocol studied in theory. Personal work of the student preparing the practices using the available documentation and reviewing the related theoretical concepts. Preparation and analysis of results. Identification of doubts that require to be resolved in personalised attention.Through this methodology the competency CG6 is developed. Software to be used: CANoe 8.5 demo.

Personalized assistance

Methodologies	Description
Lecturing	The students will be able to attend to personalised tutorials in the schedule that the professors will establish and will publish in the web page of the subject. Here, they will be able to resolve their doubts about the contents given in the Master Sessions and will be oriented about how to deal with them.
Mentored work	The students will be able to attend to personalised tutorials in the schedule that the professors will establish and will publish in the web page of the subject. Here, they will be able to resolve their doubts and will be oriented about the work that they have to do and present in the last weeks of classes.
Laboratory practical	The students will be able to attend to personalised tutorials in the schedule that the professors will establish and will publish in the web page of the subject. Here, they will be able to resolve their doubts about the development of the laboratory practices, the handle of the software of design, simulation and analysis and the specifications and operation of the modules and kits that they use.

Assessment

	Description	Qualification	Training and Learning Results	
Mentored work	Work that have to do the students and present in class. It will evaluate the work and the quality of the implementation and presentation.	40	B6 B14	
Laboratory practical	The work of the student in the laboratory will be evaluated, as well as the memories that should be deliver of the practices.	20	B6 B14	C64
Essay questions exam	Exams that will be realised in the classroom after a set of exposed subjects to evaluate the knowledges acquired by the student.	40		C64

Other comments on the Evaluation

1. First call (continuous assessment)

Following the own guidelines of the degree and the agreements of the academic commission, a system of continuous assessment will be offered to the students. Evaluation will be in Spanish.

1.a Proofs of short answer

There will be 3 proofs of short answer (type test and/or questions) properly programmed along the course. These proofs will be valued from 0 up to 10 and the final mark will be the average (NPRC):

NPRC = (NPRC1 + NPRC2 + NPRC3)/3

The proofs are not recoverable,that is to say, that if a student cannot attend the day in that they are programmed, the professor has no obligation to repeat them. The mark of the proofs that were missed will be of 0.

1.b Personalized works

A work will be assigned to the students, individually or by groups (depending of the number of students) in the first weeks of the course. This work should be delivered and presented in the last weeks of the course. The presentation of the works will be properly programmed by the professors. The implemented work and its presentation will be valued with a final mark (NT) from 0 up to 10. If the work is done in group, every student of the group will be valued with the same mark which will be the mark of the work (NT).

The student that does not deliver the work or does not present it in the indicated day will have a mark of 0.

1.c Laboratory practices

Each practice will be valued from 0 up to 10 taking into account the work made in the laboratory and the memori of that practice. The final mark of laboratory (NPL) will be the average of the qualifications obtained in the practices:

NPL = (NPL1 + NPL2 + □ + NPLn)/n

Practices can be done individually or by groups (depending of the number of students). If practices are done in group, every student of the group will be valued with the same mark (NPL).

The practices are not recoverable, that is to say, that if a student cannot attend the day in that they are programmed, the professor has no obligation to repeat them. The mark of the practices that were missed will be of 0.

1.d Final mark

The final mark (NF) will be:

NF = 0,4*NPRC + 0,4*NT + 0,2*NPL

2. First call (exam-only assessment)

The students that do not pass by continuous assessment (final qualification less than 5), will be able to present to a final exam.

The final exam will be in the dates provided for the School and will consist in a proof of short answer (type test and/or questions) (NPRC), the delivery and presentation of a work that the professors will have assigned to the student (NT) and the delivery of a laboratory work (NPL) previously assigned to the student by the professors. Each one of these parts will be valued from 0 up to 10. The students will be able to present to all these parts or which they consider appropriate. They will conserve the mark of the continuous assessment in the parts that do not present.

The calculation of the final mark will be as it was explained in the section 1.d.

3. Second call and end-of-program call

The second call and end-of-program call will have the same format that the exam-only assessment (final exam) and will be in the dates provided for the School.

The students who present to these calls can only do all the parts or only which they consider appropriate. They will conserve the mark of the first call (continuous assessment or exam-only assessment) in the parts that they do not take.

The calculation of the final mark will be as it was explained in the section 1.d. The final mark will be the best of the obtained by the student in the diferent calls.

4. Validity of the qualifications

The qualifications of the student will be valid only for the academic course in which they were obtained.

Sources of information

Basic Bibliography

Oliva N. y otros, **Redes de comunicaciones industriales**, 1ª, UNED, 2013

Complementary Bibliography

Castro M.A. y otros, **Comunicaciones industriales: principios básicos**, 1ª, UNED, 2007

Castro, M.A. y otros, **Comunicaciones industriales: sistemas distribuidos y aplicaciones**, 1ª, UNED, 2007

Recommendations

Other comments

It is recommended to have passed or be taking all the subjects of the Electronic Systems module