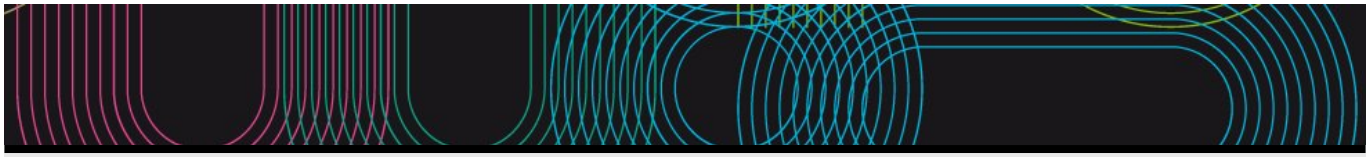

IDENTIFYING DATA				
Electronic Equipments Implementation and Exploitation				
Subject	Electronic Equipments Implementation and Exploitation			
Code	V05M145V01332			
Study programme	Máster Universitario en Ingeniería de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	2nd	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	López Sánchez, Óscar			
Lecturers	López Sánchez, Óscar Nogueiras Meléndez, Andres Augusto			
E-mail	olopez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	This subject provides the main concepts related with the analysis of reliability of complex electronic systems, as well the modelling of these, from the point of view of the reliability. It includes methodologies of design of electronic systems for applications of safety, and also the EMC analysis. Also provides insight of the relation with the management of the equipment inventory and the human capital. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. This is a translation of the subject. In case of any discrepancy, the only valid guide is the one written in Spanish.			

Training and Learning Results	
Code	
B1	CG1 Ability to project, calculate and design products, processes and facilities in telecommunication engineering areas.
B3	CG3 Ability to lead, plan and monitor multidisciplinary teams.
B7	CG7 Capacity for implementation and management of manufacturing processes of electronic and telecommunications equipment; guaranteeing safety for persons and property, the final quality of the products, and their homologation.
C15	CE15/GT1 Ability to integrate technologies and systems of Telecommunication Engineering, with general character, and at broader and multidisciplinary contexts such as bioengineering, photovoltaic conversion, nanotechnology, telemedicine.
C30	CE30/SE3 Capacity planning, evaluation and decision-making in new environments relating to the packaging of networks, services and applications in the electromagnetic field, with knowledge of reliability and life cycle costing
D3	CT3 Understanding Engineering in a framework for sustainable development.
D5	CT5 Encourage cooperative work, communication skills, management, planning and acceptance of responsibilities in an environment of multilingual and multidisciplinary work, which promotes education for equality, peace and respect for fundamental rights.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
Ability to make an analysis of electromagnetic compatibility of an electronic system according the standards	B1 B3 B7

Ability to design electronic equipment that includes specifications of maintainability and availability	B7 C15 C30 D3
Ability to specify the stocks level required for a given equipment maintainability	B7 C30
Ability to determine the life cycle cost of a product	C30 D3
Capacity to implement and manage the operation of electronic equipment	B7 C30
Ability to the assets management of an organization, related to the subject	B3 D5
Ability to understand the impact of risks, human reliability and knowledge management, in an organization	B3 B7 D3

Contents	
Topic	
Electromagnetic Interferences	Noise and interference. Design for electromagnetic compatibility (ECM). Path of electromagnetic noise. Coupling methods.
Design techniques for EMC	Analysis of conducted emissions. Analysis of radiated emissions. Common impedance coupling. Cabling. Ground system. Shielding.
EMC standards for telecommunications equipment	EMC directive 2014/30/UE. EMC basic publications. EMC generic standards. Product family standards. Emission and immunity standards, conducted and radiated. Harmonic currents standards. Grid disturbances standards. Pre-compliance EMC tests.
Introduction to the reliability of electronic systems	Definitions and basic concepts. RAMS Technologies. Parameters of the reliability of electronic components. Prediction of the reliability. Applicable technical standards. Systems in series, parallel and redundant.
Design and optimization of electronic systems	Optimization of redundancies. Analysis for mantenibilidad and availability.
Analysis of failures	Modelling by Markov and by Petri networks. Failure modes of electronic components. Determination of mechanism and ways of failures.
Fail-safe systems	Specifications for safe systems against failures. Design methodologies for fail-safe systems.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	12	24	36
Problem solving	2	6	8
Laboratory practical	10	25	35
Essay questions exam	1	0	1
Objective questions exam	1	0	1
Essay	4	40	44
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	It will develop in the schedules fixed by the direction of the engineering school. It consist of a presentation by the teacher, of the contents of the subject. Also proceed to solving examples and/or problems that illustrate the problems to be solved adequately. The student may submit all doubts and questions deemed appropriate, during the session. We will promote the more active participation of the student possible. Competences B1, B3, B3, C15, C30, D3 and D5.
Problem solving	In this educational activity we will propose problems and/or exercises subject related. They are also used to highlight the doubts and also for feedback to teachers on this aspect. Competences B1, B3, B3, C15, C30, D3 and D5.
Laboratory practical	Simulation exercises and measurements will be carried out in the laboratory. The results will be reported. Competences B1, B3, B3, C15, C30, D3 and D5.

Personalized assistance	
Methodologies	**Description**
Lecturing	Teachers will personally address doubts and queries of the students about theoretical and practical issues. Students can appoint for tutorial at the website of the University of Vigo: https://www.uvigo.gal/es/universidad/administracion-personal/pdi/oscar-lopez-sanchez, https://www.uvigo.gal/es/universidad/administracion-personal/pdi/andres-augusto-nogueiras-melendez.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	Students will carry out various practical simulations and Measurements in the laboratory. They will be done in groups. The correct execution of the practical exercises in the laboratory and the memory of the results will be assessed. Nonattendance or non-delivery of the report of results will be qualified as suspended (0). They cannot be retaken.	15	C15 C30 D5
Essay questions exam	First partial test. Written test with theoretical questions on part of the content of the subject. It will be held on the date and place set by the center. It can be retaken in the extraordinary assessment call.	35	B7 C15 C30 D3
Objective questions exam	The examination can consist of tes type questions, of short questions to develop, and/or of numerical problems.	10	B1 B7 C15 C30
Essay	Second partial test. Written test with theoretical questions, problems and exercises on the contents of the subject not included in the first partial test. It will be held on the date and place set by the center. It can be retaken in the extraordinary assessment call.	40	B1 B3 B7 C15 C30 D3 D5

Other comments on the Evaluation

Choosing of global assessment must be communicated in writing to the coordinator within one month of the start of the semester.

The end-of-program exam will be by global assessment.

The global assessment will consist of an individual written test with theoretical questions, problems and exercises that will evaluate all the content of the subject (85%) and a practical exam that will be carried out in the laboratory (15%).

In case of detection of copying or any form of plagiarism is detected in any of the tests or exams, the final grade will be fail (0), and the incident will be reported to the corresponding academic authorities for prosecution.

Sources of information

Basic Bibliography

Henry W. Ott, **Electromagnetic Compatibility Engineering**, 1ª, Wiley, 2011

López Veraguas, Joan Pere, **Compatibilidad electromagnética y seguridad funcional en sistemas electrónicos**, Marcombo, 2010

David J. Smith, **Reliability, Maintainability and Risk**, 8ª, Butterworth Heinemann, 2011

I. Fernández, A. Camacho, C. Gasco, A.M. Macías, M.A. Martín, G. Reyes, J. Rivas, **Seguridad Funcional en Instalaciones de Proceso: Sistemas Instrumentados de Seguridad y Análisis SIL**, ISA, 2012

M. Goble, H. Cheddie, **Safety Instrumented Systems Verification**, ISA, 2005

M. Goble, **Control Systems Safety Evaluation and Reliability**, 3ª, ISA, 2010

Michael D. Medoff Rainer and I. Faller, **Functional Safety: An IEC 61508 SIL 3 Compliant Development Process**, 3ª, Exida, 2014

Complementary Bibliography

T.I. Bajenescu, M.I. Bâzu, **Reliability of Electronic Components**, Springer-Verlag, 1999

P. Kales, **Reliability**, Prentice-Hall, 1998

B. R. Mehta Y. J. Reddy, **Industrial Process Automation Systems Design and Implementation**, Elsevier, 2015

ISO, **UNE-ISO 55000:2015: Gestión de activos. Aspectos generales, principios y terminología**, AENOR, 2015

Milton Ohring, **Reliability and Failure of Electronic Materials and Devices**, 2ª, Elsevier, 2015

Chris J. O´Brien, **Final Elements in Safety Instrumented Systems**, 1ª, Exida, 2018

Shahriyar Kaboli, **Reliability in Power Electronics and Electrical Machines: Industrial Applications and Performance Models**, 1ª, IGI Global, 2016

Francesco Flammini, **Railway Safety, Reliability, and Security: Technologies and Systems Engineering**, 1ª, 2012

Recommendations

Subjects that are recommended to be taken simultaneously

Signal Conditioners/V05M145V01331
Photovoltaic Power Electronics/V05M145V01330

Subjects that it is recommended to have taken before

Digital and Analog Mixed Circuits/V05M145V01213
Hardware/Software Design of Embedded Systems/V05M145V01214

Other comments

This version in English of the guide is a translation of the original one in Galician. In the case that, by mistake, there exists differences between them the original one in Galician is what prevails.