IDENTIFYING DATA

Radiocommunication

Subject	Radiocommunication
Code	V05M145V01103
Study programme	Telecommunication Engineering

Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Mandatory	1st	1st

Teaching language	Spanish
Department	
Coordinator	Arias Acuña, Alberto Marcos
Lecturers	Arias Acuña, Alberto Marcos González Valdés, Borja Rubiños López, José Óscar
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General description	In this compulsory matter of first semester, the student familiarises with the radiocommunication systems, beginning with the antenna properties, continuing with the study of the noise and interferences and finalising with the calculation of the link budget in different propagation scenarios. These concepts apply to the study of the services of radar and radiolocalization.

Competencies

Code	
A2	CB2 Students must apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
A4	CB4 Students must communicate their conclusions, and the knowledge and reasons stating them-, to specialists and non-specialists in a clear and unambiguous way.
C2	CE2 Ability to develop radio communication systems: antenna, equipment and subsystems design; channel modeling; link budgeting; and planning.
C3	CE3 Ability to implement systems by cable, line, satellite, in fixed and mobile communication environments.
C5	CE5 Ability to design systems of radio navigation and positioning, as well as radar systems.

Learning outcomes

Expected results from this subject	Training and Learning Results
Capacity to realise basic antenna designs	A2 C2
Capacity to calculate link budgets taking into account both signal and perturbations in distinct stages	A2 C2 C3
Capacity to design radionavegation and positioning systems	A4 C3 C5
Capacity to design radar systems	A4 C5

Contents

Topic

1. Basic design of antennas	1.1 Fundamental electromagnetic laws
	1.2 Trasmitting antenna
	1.3 Receiving antenna
	1.4 Bands of frequency
	1.5 Types of antennas
	1.6 Friis Formula
	1.7 Transmission losses
2. Models of noise and interferences	2.1 Thermal Noise
	2.2 Antenna Noise
	2.3 Noise Factor and noise temperature of a receptor
	2.4 Concept and types of interferences
	2.5 Characterisation of the interference
	2.6 Concept of availability, fading and diversity
	2.7 Systems limited by noise and by interference
3. Link budget for different propagation modes	3.1 Propagation in low frequencies. Surface and ionospheric waves. Electrical field received.
	3.2 Tropospheric propagation.
	3.3 Propagtion losses
4. Design of Radionavigation systems	4.1 Fundamentals of radionavigation
	4.2 Types of radionavigation systems
	4.3 Satellite radionavigation systems
	4.4 Design of a radionavigation system
5. Design of radar systems	5.1 Fundamentals of radar systems. Radar cross section
	5.2 Types of radar systems
	5.3 Design of a radar system

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	20	40
Seminars	5	30	35
Laboratory practical	13	13	26
Problem and/or exercise solving	1	11	12
Essay questions exam	1	11	12

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

Methodologies

	Description
Lecturing	Exhibition of the contained of the subject; it includes exhibition of concepts; introduction of practices and exercises; and resolution of problems and/or exercises in common classroom.
	With this methodology will work the competencies CB2, CE2, CE3 and CE5
Seminars	Teaching in small rooms, in the that the student takes part very actively in the evolution of the kinds deepening in one specific item, enlarging and relating with contents guided to the professional practice; including the participation in scientific events and/or conferences, organized or not in the own School; the organisation of enabling debates compare ideas and proposals, guided by the teacher, both physically and online; and the study of cases/analysis of situations (analysis of a problem or real case, with the aim to know it, interpreted, resolved, generate hypothesis, diagnosed and deepening in alternative procedures of solution, to see the application of the theoretical concepts in the reality). These activities can had related a lot of autonomous work of the student.
	With this methodology will work the competencies CB4, CE2, CE3 and CE5
Laboratory practical	Application, to practical level, of the knowledges and skills purchased in the theoretical kinds, by means of practices realized with equipment of test and measure, both in the laboratory or of field. Also including practices of laboratory realized on computers (simulation, analysis, processing, etc.), exercises of programming, works realized online, etc.
	With this methodology will work the competencies CB2, CE2 and CE5

Personalized assistance

Methodologies	Description
Lecturing	In this methodology, all the questions that each student can ask will be answered.
Seminars	Each student will be attended in an individual way.
Laboratory practical	Each student will be attended in an individual way.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practical	Students during the course participate in individual or group practices and perform individual jobs. The individual note for each student of this item is that corresponding to the continuous evaluation and I can be worth up to 30% of the final score.	30	A2 A4	C2 C3 C5
Problem and/or exercise solving	Final examination: it consists in a proof for the evaluation of the competencies adquired by the students by means of the resolution of simple problems and short questions of theory.	50	A2 A4	C2 C5
Essay questions exam	Final exam: it consists in a proof for the evaluation of the competencies adquired by the students. They will have to develop, organise and present the knowledges adquired during the course.	20	A2 A4	C2 C5

Other comments on the Evaluation

Students during the course participate in individual or group practices and perform individual jobs. The individual note for each student of this item is that corresponding to the continuous evaluation and I can be worth up to 30% of the final score.

All students must assist to the final exam, which consists of a test response and a test of development. The final score in the first and second call is maximum between the score of the exam (single evaluation) and the sum of the note of continuous evaluation with the score of the exam weighted in a 70%.

In case of detection of plariarism in some work/test performed, the final score of the subject will be zero and the teachers will notify this situation to the academic authorities.

Sources of information

Basic Bibliography

Marcos Arias Acuña, Oscar Rubiños López, **Radiocomunicación**, 1a, Andavira Editora, 2011

José María Hernando Rábanos, **Transmisión por Radio**, 6a, Editorial Universitaria Ramón Areces, 2008

John Griffits, **Radio Wave Propagation and Antennas. An Introduction**, 1st, Prentice Hall, 1985

Complementary Bibliography

Robert R. Collin, **Antennas and Radiowave Propagation**, 1st, Mc Graw Hill, 1985

Thomas A.Milligan, **Modern Antenna Design**, 2nd, Wiley, 2005

ngel Cardama, L. Jofre, J.M. Rius, S. Balnch, M. Ferrando, **Antenas**, 2a, Ediciones UPC, 2002

Constantine A. Balanis, **Antenna Theory. Analysis and Design**, 3rd, Wiley, 2005

ITU-R, Recommendations,

Recommendations

Subjects that continue the syllabus

Antennas/V05M145V01208

Radio Laboratory/V05M145V01209

Satellites/V05M145V01311

Wideband Radio Systems/V05M145V01312

Contingency plan

Description

In case of sanitary alert that preclude the assistance to the classrooms and physical laboratories in any moment of the term,
(i) face-to-face learning will be replaced by emergency remote teaching,
(ii) the evaluation will not take into account unrealised laboratory practices that require the use of specific material and cannot be virtualised,
(iii) the assessment shall be carried out virtually through the platform that the University of Vigo will recommend (Faitic, Remote Campus...).