Universidade Vigo

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 Rubiños López, José Óscar Vazquez Alejos, Ana
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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
Master Session	20	20	40
Seminars	4	24	28
Laboratory practises	13	13	26
Short answer tests	1	10	11
Long answer tests and development	1	10	11
Other	1	8	9

*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	Exhibition of the contents of the subject; it includes exhibition of concepts; introduction of practices and exercises; and resolution of problems and/or exercises in ordinary classroom.
Seminars	Teaching for few students; they participates very actively in the evolution of the classes deepening in a specific subject, expanding it and relating it with contents oriented to the professional practice. These activities can have related a load of autonomous work of the student.
Laboratory practises	Application, to practical level, of the knowledges and skills adquired in the theoretical classes, by means of practices realised with equipment of test and measure. Also including practical of laboratory realised on computers (simulations, analysis, processed, etc.), exercises of programming, on-line realised works, etc.

Personalized attention

Methodologies	Description
Master Session	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 practises	Each student will be attended in an individual way.

Assessment

	Description	Qualification	Training and Learning Results	
Short answer tests	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

Long answer tests and development	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	Participation in activities by part of the students, especially of the practices. This section corresponds to the continuous evaluation of the student.	30	A2 A4	C2 C5

Other comments on the Evaluation

The final examination, that will consist of the proof of short answer and the proof of development will represent 70% for the students that opt by continuous evaluation and 100% of the final note in case of not opting by the continuous evaluation.

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