



IDENTIFYING DATA

Radiocommunication

Subject	Radiocommunication		
Code	V05M145V01103		
Study programme	Máster Universitario en Ingeniería de Telecomunicación		
Descriptors	ECTS Credits	Choose	Year
	5	Mandatory	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.		

Training and Learning Results

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.

Expected results from this subject

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 radionavigation and positioning systems	A4 C3 C5
Capacity to design radar systems	A4 C5

Contents

Topic	
1. Basic design of antennas	1.1 Electromagnetic Foundations 1.2 Antennas 1.3 Friis formula Competitions related: CB2, *CE2

2. Models of noise and interferences	2.1 Thermal Noise 2.2 Noise of antenna and receptor 2.3 Interferences 2.4 Availability, fading and diversity 2.5 Radio systems limited by noise and by interference Competitions related: CB2, CE2, CE3
3. Calculation of links in distinct stages of propagation	3.1 Propagation in low frequencies 3.2 Propagation in high frequencies Competitions related: CB2, CE2
4. Design of systems of *radionavegación	4.1 Radionavegation systems foundations and types 4.2 Satellite radionavegation systems Competitions related: CB4, CE3, CE5
5. Design of systems radar	5.1 Foundations and types of radar system. Radar cross section. 5.2 Design of a radar systems Competitions related: CB4, CE5

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	18	36	54
Seminars	5	20	25
Laboratory practical	14	14	28
Problem and/or exercise solving	1	8	9
Essay questions exam	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
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 C2 A4 C3 C5

Problem and/or exercise solving	Final examination: it consists in a proof for the evaluation of the competencies acquired by the students by means of the resolution of simple problems and short questions of theory.	40	A2 A4	C2 C5
Essay questions exam	Final exam: it consists in a proof for the evaluation of the competencies acquired by the students. They will have to develop, organise and present the knowledges acquired during the course.	30	A2 A4	C2 C5

Other comments on the Evaluation

Students during the course participate in individual or group practices and do individual work within the continuous assessment. The individual grade can account for up to 30% of the final grade. In the continuous assessment, attendance at practices is mandatory, although there is no minimum number of papers submitted to obtain a grade.

The continuous evaluation will additionally consist of a written exam on the first two topics that will mean up to 30% of the mark.

All students must take the final exam on the date set by the center, which will consist of a single test for students in continuous assessment. Students who take the global evaluation will also have to take a test equivalent to the partial exam.

To pass the subject it is necessary to get a minimum of 4 out of 10 in the two written exams. If this minimum is not exceeded, the maximum rating that could be obtained would be 4.9.

The final mark, both in the ordinary and in the extraordinary, will be the highest between the mark of the written exams and the sum of the continuous evaluation mark including that of the final exam.

Any person enrolled in this subject who receives either of the two written exams will be considered submitted.

In the event of detection of plagiarism in any of the work/tests carried out, the final grade for the subject will be "Fail (0)" and the teachers will notify the school management of the matter so that they can take the appropriate measures.

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 Griffiths, **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