IDENTIFYING DATA

(*)Antenas

Subject	(*)Antenas
Code	V05M145V01208
Study programme	(*)Máster Universitario en Enxeñaría de Telecomunicación

Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd

Teaching language	English
Department	
Coordinator	Díaz Otero, Francisco Javier
Lecturers	Díaz Otero, Francisco Javier
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General description	The subject devotes to the study of antennas and covers from their electromagnetic bases to their practical design, going through the models of analysis and simulation of the behaviour of the antennas.

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.
B4	CG4 The capacity for mathematical modeling, calculation and simulation in technological centers and engineering companies, particularly in research, development and innovation tasks in all areas related to Telecommunication Engineering and associated multidisciplinary fields.
C2	CE2 The ability to develop radio communication systems: antenna, equipment and subsystems design; channel modeling; link budgeting; and planning.
C3	CE3 The ability to implement systems by cable, line, satellite, in fixed and mobile communication environments.
C5	CE5 The 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
To understand the phenomena of electromagnetic radiation and receiving signals	A4 B4
Know the main parameters that characterise the behaviour of the transmitting and receiving antennas	A4 B4 C2 C3 C5
Know the distinct types of antennas according to their applications and operating frequencies	A4 B4 C2 C3 C5
To be able to understand and develop models to simulate the behavior of the antennas and predict their characteristic parameters	A4 B4 C2 C3 C5

To be able to cope antenna design exercises for certain specifications	A2
	A4
	B4
	C2
	C3
	C5

Contents

Topic	
1. Electromagnetic antennas Basics Competencies related: CE2, CE3, CE5	1.1 Generalities 1.2 Phenomenon of electromagnetic radiation 1.3 Properties of the field of radiation 1.4 The antenna in transmission 1.5 The antenna in reception 1.6 The antenna in systems of communications and in radar
2. Modeling antennas Competencies related: CB4, CG4	2.1 Linear Antennas 2.2 Aperture Antennas 2.3 Arrays
3. Types of antennas CB4, CG4, CE2, CE3, CE5	3.1 Wire Antennas 3.2 Printed and Slot Antennas 3.3 Horns, lens and reflectors

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	15	15	30
Troubleshooting and / or exercises	3	6	9
Case studies / analysis of situations	8	24	32
Autonomous practices through ICT	0	26	26
Short answer tests	1	6	7
Practical tests, real task execution and / or simulated.	1	6	7
Long answer tests and development	2	12	14

*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	Presentation of the contents on the subject under study, instructions and exercises or projects to be developed by the student. Competencies CB2, CE2, CE3, CE5
Troubleshooting and / or exercises	Problems and / or exercises related to the subject. The student should develop appropriate or correct solutions through the exercise routines, applying formulas or algorithms, applying transformation methods available and interpretate the results. Complement of the Master session Competencies CB2, CG4, CE2.
Case studies / analysis of situations	Analysis of a fact, problem or real event in order to learn, interpret it, solve it, generate hypotheses, compare data, complete knowledges, diagnose it and train in alternative procedures of solution. Competencies CB2, CG4, CE2, CE3, CE5.
Autonomous practices through ICT	Activities of application of the knowledges to concrete situations and of acquisition of basic skills related with the matter object of study. They will be developed through ICT in an autonomous way. Competencies CB2, CB4, CG4, CE2.

Personalized attention

Methodologies	Description
Master Session	Students will have the opportunity to attend to personalized sessions in the teacher's office in the schedule that the teachers will establish at the beginning of the course for this purposes. They may also pose questions electronically.
Troubleshooting and / or exercises	Students will have the opportunity to attend to personalized sessions in the teacher's office in the schedule that the teachers will establish at the beginning of the course for this purposes. They may also pose questions electronically.
Case studies / analysis of situations	Students will have the opportunity to attend to personalized sessions in the teacher's office in the schedule that the teachers will establish at the beginning of the course for this purposes. They may also pose questions electronically.

| | Autonomous practices through ICT | Students will have the opportunity to attend to personalized sessions in the teacher's office in the schedule that the teachers will establish at the beginning of the course for this purposes. They may also pose questions electronically. |

Assessment

	Description	Qualification	Training and Learning Results
Short answer tests	Conceptual questions on the course syllabus.	10	A2
Practical tests, real task execution and / or simulated.	It will value the quality of the homeworks assigned, the participation and attitude showed in the classes, as well as the oral presentation of the work.	60	A2 A4
Long answer tests and development	Final examination: Evaluation of the competencie that includes open questions on a subject. The students have to develop, relate, organise and present the knowledges that have on the matter in an extensive answer to a practical situation posed.	30	A2 A4

Other comments on the Evaluation

It will be offered to the students enrolled in this class two systems of evaluation: continuous evaluation and evaluation at the end of the semester.

1. CONTINUOUS EVALUATION
The system of continuous evaluation will consist in:

- A short test to be held in class around the mid-teaching period. 10% rating. Rating EC1, with a maximum of 1 point.

- An exercise about antenna design for a particular application. It will be held autonomously through the use of software simulation tools. The student will prepare and deliver a report to be presented in class at the end of the semester. Rating EC2, with a maximum of 6 points. The 6 points of this exercise will be distributed as follows: 2 points for active participation in the sessions (in C groups) dedicated to the design and presentation and discussion; 2 points for the quality of the proposed solution; 1 point for the quality of the report submitted; and 1 point for the quality of the oral presentation.

- An extended-response exercise in which problems of analysis and design of antennas for specific applications will be solved. It will be held the same day fixed for the regular final exam for the course. 30% rating. Rating EC3, with a maximum of 3 points.

- The continuous assessment tests are not recoverable, ie, if a student can not fulfill them within the stipulated period the teacher is not required to repeat them.

- The final score for continuous assessment (EC) was calculated as the sum of the scores on the three planned tests: EC =EC1 + EC2 + EC3.

- The score on the assessable tasks (EC) will be valid only for the academic year in which they are made.

It is understood that a student receives this rating system when he has made the first test,given the memory of the second and made the corresponding oral presentation.At this time the student will be considered as well as presented to the exam.

2. FINAL EVALUATION OF SEMESTER

It involves:

- A final exam that will assess competencies CB2, CG4, CE2, CE3, CE5. 40% rating. EF1 score, with a maximum of 4 points.
- The day of the examination the student will deliver a report on an antenna design previously assigned. The student will give an oral presentation at a public meeting in the shortest possible time respecting the compatibility with other tests of the same course and certification. Rated EF2 with a maximum of 6 points.
- The EF1 and EF2 partial qualifications may be held only until the call of July and within the ongoing course.

3. RECOVERY IN THE CALL OF JULY

It will follow the same procedure as the evaluation at the end of the semester. Students, communicating it previously to the start of the exam, may retain their previous note EF1 part (or alternatively EC1 EC3 +) or the EF2 (or EC2) part.

COMMENTS:

- Before the completion or delivery date of each test, the procedure and review of scores will be published within a reasonable period of time.
- Every student that comes to the final test is considered as presented. It will also be considered as presented to the test every student who qualifies for the continuous assessment system in the terms described above.
- It is considered that the subject is approved if the final grade is equal to or greater than 5.

Sources of information

C.A.Balanis. "Antenna Theory. Analysis and Design", 3rd ed. Wiley, 2005.

W.L.Stutzman, G.A.Thiele. Antenna Theory and Design. Wiley, 2nd ed. 1998.

R.S.Elliot. "Antenna Theory and Design". Prentice Hall, d. Rev. 2003.

R.E.Collin. "Antennas and Radiowave Propagation". Mc Graw Hill, 1985.

P.S.Kildal. []Foundations of Antenas. A Unified Approach[]. Studentlitteratur. Sweeden,

T.A. Milligan, "Modern Antenna Design", 2nd Ed. Wiley, 2005.

Recommendations
Subjects that continue the syllabus
(*)Comunicacións Móbiles e sen Fíos/V05M145V01313
(*)Satélites/V05M145V01311
(*)Sistemas Radio en Banda Ancha/V05M145V01312

Subjects that are recommended to be taken simultaneously
(*)Laboratorio de Radio/V05M145V01209

Subjects that it is recommended to have taken before
(*)Radio/V05M145V01103