



## IDENTIFYING DATA

### Antennas

Subject	Antennas			
Code	V05M145V01208			
Study programme	Máster Universitario en Ingeniería de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd
Teaching language	English			
Department				
Coordinator	Rodríguez Rodríguez, José Luis			
Lecturers	Rodríguez Rodríguez, José Luis			
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Web				
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.			

## 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.
B4	CG4 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 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
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
4. Practices	4.1 Design of a single band planar GPS antenna 4.2 Design of a dual band GPS antenna 4.3 Measurement of the final antenna prototype

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	8	29	37
Problem solving	5	15	20
Case studies	5	15	20
Practices through ICT	5	15	20
Problem and/or exercise solving	3	9	12
Laboratory practice	2	6	8
Essay questions exam	2	6	8

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

## Methodologies

	Description
Lecturing	Presentation of the contents on the subject under study, instructions and exercises or projects to be developed by the student. Competencies A2, C2, C3, C5
Problem solving	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 A2, B4, C2.
Case studies	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 A2, B4, C2, C3, C5.
Practices through ICT	Activities of applying knowledge in a given context and acquiring basic and procedural skills in relation to the subject, through ICT. Competencies A2, A4, B4, C2.

## Personalized assistance

Methodologies	Description
Lecturing	Personalized attention. Questions and doubts during teaching timetable. Contact: <a href="https://www.uvigo.gal/universidade/administracion-persoal/pdi/jose-luis-rodriguez-rodriguez">https://www.uvigo.gal/universidade/administracion-persoal/pdi/jose-luis-rodriguez-rodriguez</a>
Problem solving	Questions and doubts during teaching timetable and in office hours.
Practices through ICT	Questions and doubts during teaching timetable, in office hours, Fatic and e-mail.

## Assessment

Description		Qualification	Training and Learning Results
Problem and/or exercise solving	Conceptual questions on the course syllabus.	10	A2
Laboratory practice	It will value the quality of the homeworks assigned, the participation and attitude showed in the lectures, as well as the oral presentation of the work.	60	A2 A4
Essay questions exam	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 assesment and exam-only assesment.

#### 1. CONTINUOUS ASSESMENT

The system of continuous assesment will consist on:

- A short test to be held in class around the mid-teaching period. 10% rating. Rating EC1, with a maximum of 1 point.
- An 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, 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 in 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:  $EC = EC1 + EC2 + EC3$ , and covers the following competences: CB2, CG4, CE2, CE3, CE5
- The score on the assessable tasks (EC) will be valid only for the academic year in which they are made.
- There is a 1 month period to leave continuous evaluation.
- The participation in practices is voluntary.

#### 2. GLOBAL ASSESMENT - ORDINARY CALL

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 exam 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 3 points for the report and 3 points for the presentation.
- The EF1 and EF2 partial qualifications may be held only until the single evaluation - second call and within the ongoing course.

#### 3. GLOBAL ASSESMENT - EXTRAORDINARY CALL

It will follow the same procedure as in global assesment - ordinary call. 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.

#### 4. GLOBAL ASSESMENT - END OF DEGREE CALL

It will follow the same procedure as in global assesment - ordinary call. 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 evaluation 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.

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### Sources of information

#### Basic Bibliography

C. A. Balanis, **Advanced Engineering Electromagnetics**, 2, Wiley, 2005

C. A. Balanis, **Antenna Theory and Design**, 4, Wiley, 2016

W.L.Stutzman,G.A.Thiele, **Antenna Theory and Design**, 3, Wiley, 2013

#### Complementary Bibliography

R.S.Elliot, **Antenna Theory and Design**, 1, Prentice Hall, 1981

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

P.S.Kildal, **Foundations of Antenas. A Unified Approach**, 1, Studentlitteratur,

T.A. Milligan, **Modern Antenna Design**, 2, Wiley, 2005

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### Recommendations

#### Subjects that continue the syllabus

Wireless and Mobile Communications/V05M145V01313

Satellites/V05M145V01311

Wideband Radio Systems/V05M145V01312

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#### Subjects that are recommended to be taken simultaneously

Radio Laboratory/V05M145V01209

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#### Subjects that it is recommended to have taken before

Radiocommunication/V05M145V01103