



## IDENTIFYING DATA

### Radio Spectrum Management

Subject	Radio Spectrum Management			
Code	V05G301V01323			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	García Sánchez, Manuel			
Lecturers	García Sánchez, Manuel Torío Gómez, Pablo			
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General description	Radio spectrum management pursues the most efficient use of the radio spectrum (a natural, limited and scarce resource), by applying effective processes that facilitate the implementation of communication systems and guarantee minimum interference between them. Engineering, planning and management tools, as well as measurement equipment and techniques to survey the use of the radio spectrum are needed to accomplish these objectives. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

## Training and Learning Results

Code	
B5	CG5: The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
B7	CG7: The ability to analyze and assess the social and environmental impact of technical solutions.
B8	CG8: To know and apply basic elements of economics and human resources management, project organization and planning, as well as the legislation, regulation and standardization in Telecommunications.
B9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.
C21	CE21/ST1 The ability to construct, exploit and manage telecommunication networks, services, process and applications, considered as systems of receiving, transporting, representation, processing, storage, management and presentation of multimedia information from the point of view of transmission systems.
C25	CE25/ST5 The ability to select transmission antennas, equipment and systems, propagation of guided and non-guided waves, with electromagnetic, radiofrequency and optical media, and their corresponding radio electric spectrum management and frequency designation.
D4	CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights.

## Expected results from this subject

Expected results from this subject	Training and Learning Results	
Understand the concepts of frequency allocation, allotment and assignment.	B6	C21
Apply concepts of base station certification.	B6	C21
	B7	
	B8	

Propose solutions for fulfilment the broadcast limits.	B5 B6 B7 B8	C25	
Interference analysis	B5 B6 B8 B9	C21 C25	D4
Field measurements	B5 B9	C21 C25	D4

## Contents

Topic	
Introduction	Introduction to the matter. General concepts.
Spectrum management	National and international regulatory bodies International management and coordination National management The Telecommunications Law National telecommunication Plans CNAF
Spectrum engineering	Specifications of telecommunication equipment. Radio wave propagation. Coverage. Interferences. Re-use distance. Techniques to share the spectrum.
Modulations	Definitions The radio channel Objective of the modulation Types Analog Modulations: AM, FM Digital Modulations Wideband Modulations MIMO
Frequency planning	Trellis method List method Other methods Examples
Technical surveillance	The spectrum analyzer The wideband sounder Measurement procedures for radioelectric base station certification

## Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	15	30	45
Practices through ICT	6	9	15
Lecturing	19	19	38
Objective questions exam	1	15	16
Objective questions exam	1	35	36

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

## Methodologies

	Description
Laboratory practical	Activities of application of the acquired knowledge to particular situations. Acquisition of basic skills related with the matter. Specific measurement equipment as Spectrum Analysers , Field level sounders, etc, will be used. Through this methodology the competencies CG5, CG6, CG8, CG9, CE21, CE25 and CT4 are developed. Group activity.
Practices through ICT	The student, alone or in a small group with other students, elaborates a report on a given subject. This includes the search of the information, reading, writting, etc Through this methodology the competencies CG9 and CT4 are developed. Group activity.

Lecturing	Field activities. Activities of application of the acquired knowledge to particular situations. Acquisition of basic skills related with the matter. Specific measurement equipment as Spectrum Analysers , Field level sounders, etc, will be used. Through this methodology the competencies CG5, CG6, CG7, CG8, CG9, CE25 and CT4 are developed. Group activity.
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### Personalized assistance

Methodologies	Description
Lecturing	The students will be able to resolve doubts and questions during the activity, in the scheduled tutoring hours or by means of email (www.teleco.uvigo.es).
Laboratory practical	The students will be able to resolve doubts and questions during the activity, in the scheduled tutoring hours or by means of email (www.teleco.uvigo.es).
Practices through ICT	The students will be able to resolve doubts and questions during the activity, in the scheduled tutoring hours or by means of email (www.teleco.uvigo.es).
Tests	Description
Objective questions exam	The students will be able to resolve doubts and questions during the activity, in the scheduled tutoring hours or by means of email (www.teleco.uvigo.es).
Objective questions exam	The students will be able to resolve doubts and questions during the activity, in the scheduled tutoring hours or by means of email (www.teleco.uvigo.es).

### Assessment

	Description	Qualification	Training and Learning Results		
Laboratory practical	These practices are made in groups. In some cases the qualification of each student will be the one of the group and in others by means of an individual exam about the practice.	40		C21 C25	
Practices through ICT	Calculation of the coverage area of an AM radio station. This practice is made in groups but will be evaluated individually by means of the assistance, the performance during the realisation and by means of the memory of the practice delivered by the group.	10	B6 B9	C21 C25	D4
Objective questions exam	Individual exam with questions and problems from the contents of the lectures.	15	B5 B6 B7 B8	C21 C25	
Objective questions exam	Individual exam with questions and problems from the contents of the lectures.	35	B5 B6 B7 B8	C21 C25	

### Other comments on the Evaluation

**1) Ordinary call.** We offer students two ways of assessment: continuous assessment and global assessment. Students will have to opt by one of them. After one month, the delivery of a report or participation in anyone of the exams of continuous evaluation means that you opt by this type of assessment and your qualification could not be "not presented". The attendance to, at least, 70% of the practices is compulsory if you opt by continuous assessment.

1.a) Continuous assessment. Assessment will be made according to the results of the report of the computer practice, the tests of the lab practices and the two exams about the lecture contents. One of these exams will be conducted at the middle of the lecture period and will encompass the matter delivered till the date of the exam. The other exam, about all the matter, will take place after the end of the lectures. These tasks are not recoverable and only are valid for the current course.

In order to guarantee that all the competences are acquired, three conditions should be met; to pass the matter:

- 1) Get a qualification equal or larger than 4 (over 10) in the theory part.
- 2) Get a qualification equal or larger than 4 (over 10) in the practice part.
- 3) Get a final qualification, calculated as weighted sum of the activities marks, equal or larger than 5 (over 10).

If condition 3) is met, but not 1) or 2), the final qualification will be 4.9

1.b) Global assessment. Students that do not opt by continuous assessment will have an exam about the lectures contents (50%) and another one about the practices (50%) in the official exam date fixed by the School.

In order to guarantee that all the competences are acquired, three conditions should be met; to pass the matter:

- 1) Get a qualification equal or larger than 4 (over 10) in the theory part.
- 2) Get a qualification equal or larger than 4 (over 10) in the practice part.
- 3) Get a final qualification, calculated as weighted sum of the activities marks, equal or larger than 5 (over 10).

If condition 3) is met, but not 1) or 2), the final qualification will be 4.9

**2) Extraordinary call.** Students that opted previously by continuous assessment will have the chance to repeat just the exam about the lecture contents (50%) or take a full exam of the subject (100%), including lectures (50%) and practices (50%). They will have to tell to the coordinator of the subject about the option they choose before the official date of the exam. The rest of the students will take a full exam of the subject (100%), including lectures (50%) and practices (50%).

In order to guarantee that all the competences are acquired, three conditions should be met; to pass the matter:

- 1) Get a qualification equal or larger than 4 (over 10) in the theory part.
- 2) Get a qualification equal or larger than 4 (over 10) in the practice part.
- 3) Get a final qualification, calculated as weighted sum of the activities marks, equal or larger than 5 (over 10).

If condition 3) is met, but not 1) or 2), the final qualification will be 4.9

**3) End-of-program call.** Full exam of the subject (100%), including lectures (50%) and practices (50%).

In order to guarantee that all the competences are acquired, three conditions should be met; to pass the matter:

- 1) Get a qualification equal or larger than 4 (over 10) in the theory part.
- 2) Get a qualification equal or larger than 4 (over 10) in the practice part.
- 3) Get a final qualification, calculated as weighted sum of the activities marks, equal or larger than 5 (over 10). If condition 3) is met, but not 1) or 2), the final qualification will be 4.9

***Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.***

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## Sources of information

### Basic Bibliography

International Telecommunication Union, **National Spectrum management Manual**, 2005,

### Complementary Bibliography

International Telecommunication Union, **ITU-R recommendations**,

International Telecommunication Union, **Radiocomunication Rules**, 2012,

Gretel-COIT, **La evolución de la gestión del espectro radioeléctrico**, 2007,

SETSI, **Cuadro Nacional de Atribución de Frecuencias**, 2013,

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## Recommendations