



## IDENTIFYING DATA

### Radio Spectrum Management

|                     |   |          |      |            |
|---------------------|---|----------|------|------------|
| Subject             | Radio Spectrum Management   |          |      |            |
| Code                | V05G300V01616   |          |      |            |
| Study programme     | Degree in Telecommunications Technologies Engineering   |          |      |            |
| Descriptors         | ECTS Credits  | Choose   | Year | Quadmester |
|                     | 6   | Optional | 3rd  | 2nd        |
| Teaching language   | Spanish Galician  |          |      |            |
| Department          | Signal Theory and Communications  |          |      |            |
| Coordinator         | García Sánchez, Manuel  |          |      |            |
| Lecturers           | García Sánchez, Manuel<br>Torío Gómez, Pablo  |          |      |            |
| E-mail              | manuel.garciasanchez@uvigo.es   |          |      |            |
| Web                 | <a href="http://fatic.uvigo.es">http://fatic.uvigo.es</a>   |          |      |            |
| General description | The management of the radioelectric spectrum, a natural resource, limited and scarce, pursues the most efficient use of the spectrum by means of the application of effective processes, to facilitate the implementation of communication systems and to guarantee minimum interference. To accomplish this objectives, engineering tools, planning, management and technical survey and certification are needed. Besides in this matter study of the SMATV systems and Structured Wiring are included. |          |      |            |

## Competencies

|      |  |
|------|--|
| 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.  |

## Learning outcomes

|  |                               |     |
|--|-------------------------------|-----|
| 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                            | C25 |
|  | B6                            |     |
|  | B7                            |     |
|  | B8                            |     |

|                                      |                      |            |    |
|--------------------------------------|----------------------|------------|----|
| Interference analysis                | B5<br>B6<br>B8<br>B9 | C21<br>C25 | D4 |
| Telecommunications Cabling Standards | B5<br>B6<br>B8       | C21<br>C25 |    |
| Field measurements                   | B5<br>B9             | C21<br>C25 | D4 |

## Contents

### Topic

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

## Planning

|                      | Class hours | Hours outside the classroom | Total hours |
|----------------------|-------------|-----------------------------|-------------|
| Laboratory practices | 1           | 2                           | 3           |
| Supervised work      | 3           | 45                          | 48          |
| Computer practices   | 6           | 6                           | 12          |
| Studies excursion    | 11          | 11                          | 22          |
| Others               | 2           | 25                          | 27          |
| Lecturing            | 19          | 19                          | 38          |

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

## Methodologies

| Description |
|-------------|
|-------------|

|                      |   |
|----------------------|---|
| Laboratory practices | 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.<br>Through this methodology the competencies CG5, CG6, CG8, CG9, CE21, CE25 and CT4 are developed.<br>Group activity.                  |
| Supervised work      | 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, writing, etc<br>Through this methodology the competencies CG9 and CT4 are developed.<br>Group activity.   |
| Computer practices   | Activities of application of the acquired knowledge to particular situations. Acquisition of basic skills related with the matter using computer programs.<br>Through this methodology the competencies CG5, CG6, CG8, CG9, CE21, CE25 and CT4 are developed.<br>Group activity.  |
| Studies excursion    | 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.<br>Through this methodology the competencies CG5, CG6, CG7, CG8, CG9, CE25 and CT4 are developed.<br>Group activity. |
| Others               | Written exam on the contents of the matter.<br>Through this methodology the competencies CG5, CG6, CG7, CG8, CE21 and CE25 are developed.   |
| Lecturing            | Master lecture given by the teacher.<br>Through this methodology the competencies CG5, CG6, CG7, CG8, CE21 and CE25 are developed.<br>Group activity.   |

### Personalized attention

| Methodologies        | Description   |
|----------------------|---|
| Lecturing            | The students will be able to resolve doubts and questions during the face-to-face hours of the activity, in schedule of *tutorías or by means of email. |
| Laboratory practices | The students will be able to resolve doubts and questions during the face-to-face hours of the activity, in schedule of *tutorías or by means of email. |
| Supervised work      | The students will be able to resolve doubts and questions during the face-to-face hours of the activity, in schedule of *tutorías or by means of email. |
| Computer practices   | The students will be able to resolve doubts and questions during the face-to-face hours of the activity, in schedule of *tutorías or by means of email. |
| Studies excursion    | The students will be able to resolve doubts and questions during the face-to-face hours of the activity, in schedule of *tutorías or by means of email. |

### Assessment

|                      | Description   | Qualification | Training and Learning Results |            |    |
|----------------------|---|---------------|-------------------------------|------------|----|
| Laboratory practices | Measurement of signals on panel for distribution of TV signal. This practice is made in groups and the qualification of each student will be the one of the group.  | 2.5           | C21<br>C25                    |            |    |
| Supervised work      | Monographss on subjects related to spectrum management that will be presented in class. They will be evaluated in an individual way in function of the exhibition realised by each student.   | 15            | B9                            | D4         |    |
| Computer practices   | 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. | 5             | B6<br>B9                      | C21<br>C25 | D4 |
| Studies excursion    | Basic use of a spectrum analyzer. Measurement of the bandwidth of a FM signal. Measurement of TDT signals. They will be evaluated by means of a written exam at the end of the practice.  | 27.5          | B5<br>B7<br>B9                | C21<br>C25 | D4 |
|                      | Installation of a parabolic antenna. Phase 1 and phase 2 radio station measurements. These practices will be made in groups and the qualification of each student will be the one of the group.   |               |                               |            |    |
| Others               | Written exams of the contents of the matter. Individual evaluation.   | 50            | B6<br>B7<br>B8                | C21<br>C25 |    |

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## Other comments on the Evaluation

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1)Announcement of "first opportunity". Following the proper guidelines of the titulación will offer to the alumnado that curse this subject two systems of evaluation in the announcement of "first opportunity": continuous evaluation and final evaluation. The alumnado will have to opt by an of the two options of evaluation. The delivery or participation in anyone of the proofs of continuous evaluation means that you opt by this type of evaluation and his qualification will not be able to be "no presented". The assistance to the practices is compulsory if you opt by continuous evaluation.

To) continuous Evaluation. The continuous evaluation will realize in base to the exert during the realization of the practices, to the memory of the practice of computer and to the proofs realized in the others seven practices. Also will evaluate the work tutelado by means of the presentation of the same in kind. There will be two examenes partial writings of the part of theory, one around the middle of the cuatrimestre and another once finalizadas the kinds of theory. These tasks are not recoverable and only are valid for the current course.

b) Final evaluation. The alumnado that do not opt by continuous evaluation will realize an examination of the theoretical part (50%) and another of the practical part (50%) in the official date of examination agreed by the School.

2) Announcement of "second opportunity". The alumnado that opted previously by continuous evaluation will be able to opt between repeating the examination of the theoretical part (50% of the note) or examine again of all the subject (100% of the note) by means of two examinations that will range so much the theoretical part (50%) and the practical part (50%). They will have to communicate to the coordinator the option that choose before the official date of the examination. The rest of the alumnado will examine of all the subject by means of two examinations that will range the theoretical part (50%) and the practical part (50%).

3) Announcement extraordinaria. They will examine of all the subject by means of two examinations that will range so much the theoretical part (50%) and the practical part (50%).

***In case of detection of plagio in anyone of the proofs (short proofs, partial examinations or final examination), the final qualification will be of SUSPENSO (0) and the fact will be communicated to the direction of the Centre for the timely effects.***

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## Sources of information

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### 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

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

Signal Transmission and Reception Techniques/V05G300V01404

Electromagnetic Transmission/V05G300V01303

Radio Communication Systems/V05G300V01512

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