



IDENTIFYING DATA

(*)Circuitos de radiofrecuencia

Subject	(*)Circuitos de radiofrecuencia			
Code	V05G300V01511			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Isasi de Vicente, Fernando Guillermo			
Lecturers	Isasi de Vicente, Fernando Guillermo			
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General description	Main radio system circuits are studied. Structure and main characteristics are worked and student learn how to evaluate them.			

Competencies

Code	
A4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
A6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
A8	CG8: To know and apply basic elements of economics and human resources management, project organization and planning, as well as the legislation, regulation and standarization in Telecommunications.
A9	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.
A33	CE24/ST4 The ability to select circuits, subsystems and systems of radiofrequency, microwaves, broadcasting, radio link and radio determination.
A34	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.

Learning aims

Expected results from this subject	Training and Learning Results
Student will be able to evaluate radiofrequency circuits and the adequacy to requirements. Also he/she can physically measure key parameters on circuits to evaluate them. In this subject main subsystems of a radiocommunication system will be treated.	A4 A6 A8 A9 A33 A34

Contents

Topic	
Main radiocommunication systems characteristics.	Non linear effects
Use of radiofrequency laboratory equipment.	Use and understanding of laboratory equipment: Spectrum analyzer Network analyzer Signal source

Filters	Practical basis of radiofrequency filters design
Study of amplifiers.	Main characteristics Noise in amplifiers
Oscillators	Non linear treatment Oscillators measurement Voltage controlled oscillators (VCO) Phase noise
Mixers	Basic approach Main mixers structures
Frequency synthesizers	Based in PLL. Direct digital synthesis.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	2.5	3.5
Master Session	17	42.5	59.5
Practice in computer rooms	2	3	5
Laboratory practises	16.5	33	49.5
Jobs and projects	1	1	2
Short answer tests	4	24	28
Practical tests, real task execution and / or simulated.	0.5	2	2.5

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

Methodologies

	Description
Introductory activities	Student will be guided to study of previous required knowledge using various sources in order to adequate subject study. Student is encouraged to make use of tutorship hours in order to solve more difficult topics.
Master Session	Lecture at classroom using blackboard and computer about subject theory
Practice in computer rooms	Learning of some EDA (computer design applications) for design and test of radiocommunication systems.
Laboratory practises	Radiocommunication systems measurements. Use of radiocommunication circuit measurement equipment. Basic knowledge about radiofrequency circuits manufacturing. Team work using official standards and specifications.

Personalized attention

Methodologies	Description
Laboratory practises	Student will work at laboratory assisted by professor. If student is not able to finish assigned work, he/she can finish it out of official laboratory hours
Practice in computer rooms	Student will work at laboratory assisted by professor. If student is not able to finish assigned work, he/she can finish it out of official laboratory hours
Tests	Description
Jobs and projects	Student will work at laboratory assisted by professor. If student is not able to finish assigned work, he/she can finish it out of official laboratory hours
Practical tests, real task execution and / or simulated.	Student will work at laboratory assisted by professor. If student is not able to finish assigned work, he/she can finish it out of official laboratory hours

Assessment

	Description	Qualification
Master Session	Class with blackboard in classroom with occasional support of computer,	0
Practice in computer rooms	Some questions to test if student knows the tools explained.	5
Laboratory practises	Questions of the professor and evaluation on the fly of the work of laboratory	10
Jobs and projects	Team project. Evaluation is done to one of the team's student randomly chosen. This examination is oral and student will answer professor's questions. Team's qualification will be fixed by this examination.	20
Short answer tests	Theoretical problems written examination. Four tests for continuous assesment with relative weight of (5%, 6%, 6% and 8%) and to the end of the course other similar test with a 25% of total qualification.	50

Other comments on the Evaluation

If student doesn't want to do a continuous assesment, final exam will have two parts: some numerical questions and a practical laboratory exercise. The score of this exam will be subject global score.

In laboratory work student will be asked about some topics in which he/she is at this time working. The answers will be considered in laboratory qualification.

At computer laboratory student will be required to solve some problems using tools which are been treated in this laboratory. The answers will be considered in laboratory qualification.

Groups of three students will be asked for work in a project. Result of work will be explained by one studen picked in a random way

Continuous assesment will be done by four partial exams. This exams will be some problems about topics explained previously. They will be at 2^a, 3^a, 6^a and 10^a weeks of course. Share of them will be, respectively: 5%, 6%, 6% and 8%. Student can choose between continuous assesment or final examination until the day of first partial exam (2^a week). For final examination choosing student must communicate to professor verbally or via email with confirmation from professor. If continuous assesment is choosed, laboratory practices are mandatory, allowing a maximum of 20% non-attendance hours. Lost practices are recoverable arranging an hour with professor.

Practical exams student will make test and measurements similar to the laboratory practices ones.

Student will can keep score of any examination along the course if he has chosen continuous assesment. Three examinations will be done:

- . Theoretical problems examination intended to improve qualification of some of the partial examinations done before.
- . Practical (laboratory) examination to evaluate computer and hardware knowledge.
- . Exposition of the group project.

To prepare practical examination, student must adjust with professor the timing of some laboratory practices. These practices can be used as evaluation.

Sources of information

Electrónica de comunicaciones, **M. Sierra y otros**, 1,
Apuntes de la asignatura, **F. Isasi**, 1,
Solid state radio engineering, **Kraus, Bostian y Raab**, 1,
James W. Nilsson, Susan A. Riedel, **Circuitos eléctricos**, 7,

Recommendations

Subjects that continue the syllabus

(*)Circuitos de microondas/V05G300V01611
(*)Redes e sistemas sen fíos/V05G300V01615

Subjects that it is recommended to have taken before

(*)Física: Fundamentos de electrónica/V05G300V01305
(*)Técnicas de transmisión e recepción de sinais/V05G300V01404
(*)Tecnoloxía electrónica/V05G300V01401
(*)Transmisión electromagnética/V05G300V01303
