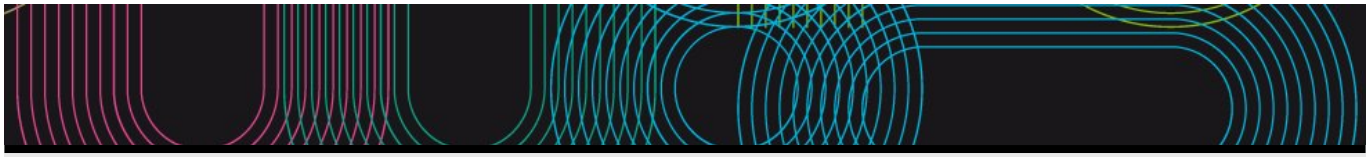

IDENTIFYING DATA				
Radio Frequency Circuits				
Subject	Radio Frequency Circuits			
Code	V05G300V01511			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	1st
Teaching language	Spanish			
Department				
Coordinator	Isasi de Vicente, Fernando Guillermo			
Lecturers	Isasi de Vicente, Fernando Guillermo			
E-mail	fisasi@uvigo.es			
Web	http://faitic.uvigo.es			
General description	Main radio system circuits are studied. In this matter main characteristics and structure are treated. The evaluation of this circuits is studied too.			

Competencies	
Code	
B4	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.
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
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 standarization 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.
C24	CE24/ST4 The ability to select circuits, subsystems and systems of radiofrequency, microwaves, broadcasting, radio link and radio determination.
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.
D2	CT2 Understanding Engineering within a framework of sustainable development.
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		
Learn to understand subcircuits' specifications and the impact that have such specifications in whole system. From these specifications learn to develop a circuit that fulfill them proposing solutions of engineering in which prices, terms, availabilities, etc. wich have a paramount importance.	B4 B8 B9	C24 C25	D2 D4
Learn the effect that each parameter of the specifications of a circuit has in the complete system.	B6		
Learn to analyse the priorities of the parameters in different circumstances.	B4 B6	C24 C25	D2 D4

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
Filtros	Theorical and practical principles of radiofrequency filters.
Study of amplifiers.	Main characteristics Noise in amplifiers
Oscillators	Non linear treatment Oscillators measurement Voltage controlled oscillators (VCO) Phase noise
Frequency synthesizers	Based in PLL. Direct digital synthesis.
Mixers	Basic approach Main mixers structures

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. Through this methodology the competencies CG4, CG6, CG8, CE24 y CE25 are developed.
Practice in computer rooms	Learning of some EDA (computer design applications) for design and test of radiocommunication systems. Through this methodology the competencies CG4, CG6, CG9, CE24 y CE25 are developed.
Laboratory practises	Radiocommunication systems measurements. Use of radiocommunication circuit measurement equipment. Basic knowledge about radiofrequency circuits manufacturing. Team work using official standards and specifications. Through this methodology the competencies CG4, CG6, CG9, CE24, CE25, CT2 y CT4. are developed.

Personalized attention

Methodologies	**Description**
Laboratory practises	In laboratory practises the professor is pays attention to students' work to solve any question. Moreover, students can make use of tutor sessions at professor's office. The timetable of this tutor sessions is announced in subject's web page at the start of course.
Practice in computer rooms	In laboratory practises the professor is pays attention to students' work to solve any question. Moreover, students can make use of tutor sessions at professor's office. The timetable of this tutor sessions is announced in subject's web page at the start of course.
Tests	**Description**
Jobs and projects	In addition of master classes, students can make use of tutor sessions at professor's office. The timetable of this tutor sessions is announced in subject's web page at the start of course.
Practical tests, real task execution and / or simulated.	In doing tests, student's ability must be shown without help.

Assessment

	Description	Qualification	Training and Learning Results	
Master Session	Class of blackboard in classroom with occasional support of computer,	0		
Practice in computer rooms	Tests in order to evaluate the correct comprension and ability in use of informatic tools.	5	B4	C24 C25
Laboratory practises	Questions of the professor and evaluation on the fly of the work of laboratory.	10	B4 B6	C24 C25
Jobs and projects	Project to work into a team. A presentation of the results will be done to professor in wich some questions could be asked. The team's member who presents results is chosen by random between all team's members.	20	B4 B6 B8 B9	C24 C25
Short answer tests	Written tests of numerical problems.Three contiunuous assesment (5%, 15%, y 15%) plus one test at the end of course (15%) for students following continuous assesmnt. When a student doesn't follow continuous assesmnt or haven't done three or more continuous assesmnt tests, will do a test at the end of course which will have a value of 50% of the global qualification if student has done lab practises and C group's proyect. If student has not done such practises and proyect, has to contact professor for a practical assesment (50%) and a problems test (50%). To pass the subject it is neccesary to get a minimum average mark of 3 out of 10 in problems tests. If this condition is not accomplished final mark will be 4 if total average is equal or higher than this mark or the total average in other cases.	50	B4 B6	C24 C25
Practical tests, real task execution and / or simulated.	Evaluation of practic work. Results of the necessary calculations for the development of the practices.	15	B4 B6 B8	C24 C25

Other comments on the Evaluation

Continuous assesement: To pass the subject by continuous assesment it is mandatory to get a 3 points out of 10 in average out of all problems tests. If this condition is not accomplished final mark will be 4 if total average is equal or higher than this mark or the total average in other cases.

B groups practices: If continuous assesment is chosen laboratory practices are mandatory and the maximum number of absences is 20%. The student can do missing practices agreeing with professor about date and hour to do practices if it is possible.

C groups practices: a practical project is proposed to a group of students. This project is de design, construction and test of a practical circuit. This work is evaluated by oral exposition carrid by one or more students from the team. These students will be chosen by random way.

Final and july examinations:

Both in final and july examinations if a student has not done B or C practices, the value of them is the same as in continuous assesment (B: 30% and C: 20%). If some of them are missing student can be examined about them in practical way or by written questions in problem examination. This is a professor's choice.

These practical examinations can be done also by students which want to improve previous marks.

If final or july examination is chosen the marks obtained in continous assesment tests has no validity.

Problems tests will be about matters explained in theory lectures and laboratories.

In laboratory, student has to answer practical questions and has to show his ability in the use of laboratory equipment and comprehension of the circuits used in practices.

Sources of information

Basic Bibliography

Apuntes de la asignatura, **F. Isasi**, 1,

Complementary Bibliography

Electrónica de comunicaciones, **M. Sierra y otros**, 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

Microwave Circuits/V05G300V01611
Wireless Systems and Networks/V05G300V01615

Subjects that it is recommended to have taken before

Physics: Fundamentals of Electronics/V05G300V01305
Signal Transmission and Reception Techniques/V05G300V01404
Electronic Technology/V05G300V01401
Electromagnetic Transmission/V05G300V01303