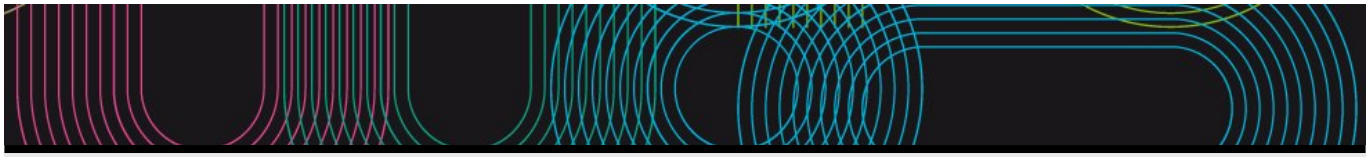

IDENTIFYING DATA				
Radio Frequency Circuits				
Subject	Radio Frequency Circuits			
Code	V05G300V01511			
Study programme	Degree in Telecommunications Technologies Engineering - In extinction			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	1st
Teaching language	#EnglishFriendly Spanish			
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. 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.			

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.
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 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
Lecturing	17	42.5	59.5
Practices through ICT	2	3	5
Laboratory practical	16.5	33	49.5
Essay	1	1	2
Problem and/or exercise solving	4	24	28
Laboratory practice	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. It is a group activity.
Lecturing	Lecture at classroom using blackboard and computer about subject theory. Through this methodology the competencies CG4, CG6, CG8, CE24 y CE25 are developed. It is a group activity. International students will be allowed to ask the professor for: a) Information sources and bibliographic references for the study of subject in english. b) have the tutor sessions in english c) tests in english.
Practices through ICT	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. It is a group activity.
Laboratory practical	Radiocommunication systems measurements. Use of radiocommunication circuit measurement equipment. Basic knowledge about radiofrequency circuits manufacturing. Team project using official standards and specifications. Through this methodology the competencies CG4, CG6, CG9, CE24, CE25, CT2 y CT4. are developed. It is a group activity.

Personalized assistance

Methodologies	**Description**
Laboratory practical	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. Office hours will be scheduled by the professor when a student sends an email asking for it. They will be at the professor's virtual office.
Practices through ICT	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. Office hours will be scheduled by the professor when a student sends an email asking for it. They will be at the professor's virtual office.
Tests	**Description**
Essay	In addition of master classes, students can make use of tutor sessions at professor's office. Office hours will be scheduled by the professor when a student sends an email asking for it. They will be at the professor's virtual office.
Laboratory practice	In doing tests, student's ability must be shown without help.

Assessment

	Description	Qualification	Training and Learning Results

Lecturing	Class of blackboard in classroom with occasional support of computer,	0			
Practices through ICT	Tests in order to evaluate the correct comprension and ability in use of informatic tools.	5	B4 C24 B6 C25		
Laboratory practical	Questions of the professor and evaluation on the fly of the work of laboratory.	10	B4 C24 B6 C25		
Essay	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. In case of online tuition, then the evaluation the examination would be oral.	20	B4 C24 B6 C25		
Problem and/or exercise solving	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. In case of online tuition, then the evaluation will be carried out as follows: they will be carried out online including the possibility of a videoconference in which the professor has the possibility of seeing the student and his/her near environment. The test could be as well oral by videoconference.	50	B4 C24 B6 C25		
Laboratory practice	Evaluation of practic work. Results of the necessary calculations for the development of the practices.	15	B4 C24 B6 C25	D2 D4	

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. The schedule of the different tests of continuous assesment will be approved by an Academic Commission of Degree (CAG) and will be available at the beginning of the semester. A student chooses continous assesment when two or more tests are done. Intermediate tests have not a second opportunity.

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.

If a student follows continuous assesment, the final mark can not be "not assesed".

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 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**.**

Plan of contingency:

In case of online tuition, then the evaluation will be carried out as follows:

The tests would be by videoconference or by an online multiple choice test during a short time. About the laboratory test, if the number of students allows it, it would be an oral test by videoconference. For the C groups evaluation, it would be like B groups but the test would be simultaneous for all participants in the group.

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/V05G301V01322
Wireless Systems and Networks/V05G301V01326

Subjects that it is recommended to have taken before

Physics: Analysis of Linear Circuits/V05G301V01108
Mathematics: Calculus 1/V05G301V01101
Mathematics: Calculus 2/V05G301V01106
Signal Transmission and Reception Techniques/V05G301V01208
Electronic technology/V05G301V01206
Analogue Electronics/V05G301V01311

Other comments

Studens should be skillful in network analisys and know the small signal equivalent circuits.
Electronics subjects around the transistor must be reviewed.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===
In front of the uncertain and unpredictable evolution of the sanitary alert caused by the *COVID-19, the University of Vigo establishes an extraordinary planning that will activate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a no face-to-face stage or partially face-to-face. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a more agile and effective way when being known in advance (or with a wide *antelación) by the students and the *profesorado through the tool normalised and institutionalised of the educational guides.

=== ADAPTATION OF THE METHODOLOGIES ===
* educational Methodologies that keep
The theoretical classes keep the same and with the same schedule but of on-line form.
* Educational methodologies that modify
The practices of laboratory, in case of not being able to be face-to-face, will modify in order to not affect learning outcomes, fullfilling the neccesary competences.

* Mechanism no face-to-face of attention to the students (*tutorías)
The *tutorías do not modify for being in remote in all the cases.

* Additional bibliography to facilitate the car-learning
In case to use some distinct application of the one of the face-to-face teaching, the professor will provide to the students the manuals and the necessary information for his efficient use.

=== ADAPTATION OF THE EVALUATION ===
Plan of contingency:

In the case in that the teaching was exclusively no face-to-face, then the evaluation will make as follows:

it will examine of the theory by videoconference or by an examination type on-line test with a time limited. With regard to the laboratory will examine to the student, if the number of the same allows it, of oral form by videoconference. With regard to the projects of groups C will be of equal way but of simultaneous form for all the group that has done the project.
The weights of the different examinations keep have done of face-to-face or remote form.