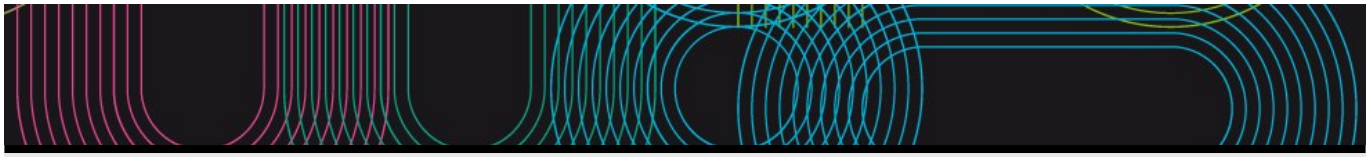

IDENTIFYING DATA				
(*)Laboratorio de Radio				
Subject	(*)Laboratorio de Radio			
Code	V05M145V01209			
Study programme	(*)Máster Universitario en Enxeñaría de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd
Teaching language	English			
Department				
Coordinator	Torío Gómez, Pablo			
Lecturers	Torío Gómez, Pablo			
E-mail	ptorio@uvigo.es			
Web	http://faitic.uvigo.es			
General description	Intensification in the knowledge of the diverse systems of radius applying a practical methodology of analysis and synthesis			

Competencies	
Code	
A1	CB1 The knowledge and understanding needed to provide a basis or opportunity for being original in developing and/or applying ideas, often within a research context.
A2	CB2 Students must apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
B8	CG8 The ability to apply acquired knowledge and to solve problems in new or unfamiliar environments within broader and multidiscipline contexts, being able to integrate knowledge.
C2	CE2 The ability to develop radio communication systems: antenna, equipment and subsystems design; channel modeling; link budgeting; and planning.
C3	CE3 The ability to implement systems by cable, line, satellite, in fixed and mobile communication environments.
C5	CE5 The ability to design systems of radio navigation and positioning, as well as radar systems.
C13	CE13 The ability to apply advanced knowledge of photonics, optoelectronics and high-frequency electronics.

Learning outcomes	
Expected results from this subject	Training and Learning Results
* Knowledge of the basic instrumentation for measuring radiofrequency, microwaves, millimeter and sub-millimeter waves	A1 A2 B8 C2 C3 C5 C13
* Knowledge of the main configurations for measuring characteristic parameters of different subsystems: Measure of impedance, transmission and reflection coefficients, noise factor, dynamic margin, and field strength level.	A1 A2 B8 C2 C3 C5 C13

* Knowdlege of experimental characterization techniques regarding the mechanisms of signal propagation.	A1 A2 B8 C2 C3 C5 C13

Contents
Topic
The students will realise some of the following practical: 1. Basic instrumentation. 2. Measures of active elements. · Measure of parameters of transmission and reflection in quadripoles · Measure of the noise factor · Measure of reception parameters (noise, selectivity, sensitivity, dynamic margin....) · Effect of the LNA in the sensitivity of the receptor and with this measured of propagation. · Measure of amplifiers of power of RF: efficiency, gain,... · Measure of parameters of oscillators. 3. Measure of passive elements · Measured of passive filters of RF: losses, selectivity,.... · Measure of the frequency of cut of a wave guide · Measured of antennas: diagrams, gain and join up electromagnetic. · Measure of common elements of microwaves: circulators, directional couplers,... 4. Measures of propagation. · Measure of mitigation with distance · Measured of mitigation with obstacles. Analysis of the phenomena of transmission and reflection. · Statistical study of the variability of the signal 5. Use of a radar. 6. Measures of electromagnetic compatibility. 7. Measures in millimeter and sub-millimeter bands 8. Design, setting and measure of a LNA 9. Design, setting and measure of an oscillator of RF. 10. Analog modulations 11. Digital modulations 11. Network analyzers 12. Software Defined Radio (rowing sports club) 13. Digital Video Broadcasting Terrestrial (DVB-T) 14. Digital Radio Mondiale (DRM)

Planning			
	Class hours	Hours outside the classroom	Total hours
Case studies / analysis of situations	2	10	12
Laboratory practises	22	65	87
Master Session	4	20	24
Short answer tests	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Case studies / analysis of situations	Practical demonstrations
Laboratory practises	Setting and measure of circuits and telecommunication systems. Employing specific instrumental.
Master Session	Explanation of the theoretical-practical basis of the work to be developed by the students in the laboratory.

Personalized attention	
Methodologies	**Description**
Laboratory practises	Tutoring to solve issues related to master sessions or lab practice is implemented: -> Individually or -> in reduced groups (no more than 2-3 students). E-mail confirmation to match the date of the appointment is needed.
Master Session	Tutoring to solve issues related to master sessions or lab practice is implemented: -> Individually or -> in reduced groups (no more than 2-3 students). E-mail confirmation to match the date of the appointment is needed.
Case studies / analysis of situations	Tutoring to solve issues related to master sessions or lab practice is implemented: -> Individually or -> in reduced groups (no more than 2-3 students). E-mail confirmation to match the date of the appointment is needed.

Assessment				
	Description	Qualification		Training and Learning Results
Laboratory practises		50		C2 C3 C5 C13
Short answer tests		50	A1 A2	B8

Other comments on the Evaluation

Two evaluation systems are offered:

CONTINUOUS EVALUATION, that is the ordinary recommended method, around which educational activities are scheduled, and an option ofNOT CONTINUOUS EVALUATION, which is recommended for those situations in which it results impossible to follow the ordinary method
CONTINUOUS EVALUATIONThe continuous evaluation consists of the proofs that detail to continuation:* Laboratory practices (Weight: 50%)* Proof of short answer (Weight: 50%)
NOT CONTINUOUS EVALUATIONThe not continuous evaluation consists of:* Examination on laboratory practice (Weight: 50%)* Proof of short answer (Weight: 50%)
RETAKE:The student been evaluated by Continuous Evaluation can opt between two possibilities the same day of the examination:* Realise again the Proof of short answer in the official date assigned by the Centre and be evaluated according to the stipulated for the system of □CONTINUOUS EVALUATION□* Be evaluated with an only final examination in the official date assigned by the Centre, as the stipulated for the system of □NOT CONTINUOUS EVALUATION□.
The student not been evaluated by continuous Evaluation:* will be evaluated with an only final examination in the official date assigned by the Centre, as the stipulated for the system of □NOT CONTINUOUS EVALUATION□

Sources of information

Ulrich Reimers, **DVB : The family of international standards for digital video broadcasting**,
M. E. Van Valkenburg, **Network analysis**,
Walter Tuttlebee, **Software defined radio : Enabling technologies**,
Wes Hayward, **Introduction to radio frequency design**,
George Brown, **Radio and electronics cookbook**,
John Davies, **Newnes radio and RF engineer's pocket book**,
Y.T. Lo, S.W. Lee, **Antenna handbook**,
Rajeswari Chatterjee, **Antenna theory and practice**,
Yi Huang, Kevin Boyle, **Antennas : from theory to practice**,
Walter C. Johnson, **Transmission lines and networks**,
Brian C. Wadell, **Transmission line design handbook**,
Fuqin Xiong, **Digital modulation techniques**,

Besides the literature mentioned the student will have as support material:

- Scripts of theory: this material contains the theoretical basis of what is discussed in more detail in the master sessions.

- Scripts of practices: formulations and problems of each practice session.

- Copy of the artwork used in the master sessions.

- Tasks and proposed problems.

Recommendations

Subjects that continue the syllabus

(*)Comunicacións Móbiles e sen Fíos/V05M145V01313
(*)Satélites/V05M145V01311
(*)Sistemas Radio en Banda Ancha/V05M145V01312

Subjects that are recommended to be taken simultaneously

(*)Antenas/V05M145V01208
(*)Comunicacións Ópticas/V05M145V01207
(*)Electrónica e Fotónica para Comunicacións/V05M145V01202

Subjects that it is recommended to have taken before

(*)Radio/V05M145V01103
(*)Tratamento de Sinal en Comunicacións/V05M145V01102