UniversidadeVigo

IDENTIFYING DATA
Radio Laboratory

Subject	Radio Laboratory
Code	V05M145V01209
Study programme	Máster Universitario en Ingeniería de Telecomunicación

Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd

Teaching language	English
Department	
Coordinator	Torío Gómez, Pablo
Lecturers	Torío Gómez, Pablo
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Web	http://moovi.uvigo.gal
General description	Deepening in the knowledge of the diverse systems of radius applying a practical methodology of analysis and synthesis

Training and Learning Results

Code	
A1	CB1 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 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 Ability to develop radio communication systems: antenna, equipment and subsystems design; channel modeling; link budgeting; and planning.
C3	CE3 Ability to implement systems by cable, line, satellite, in fixed and mobile communication environments.
C5	CE5 Ability to design systems of radio navigation and positioning, as well as radar systems.
C13	CE13 Ability to apply advanced knowledge of photonics, optoelectronics and high-frequency electronics.

Expected results from this subject

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 (SDR) 13. Vector signal generators 14. Digital Video Broadcasting Terrestrial (DVB-T) 15. Digital Radio Mondiale (DRM)	All of the tasks will be carried out as Laboratory Practices, using the equipment available at the School.

Planning

	Class hours	Hours outside the classroom	Total hours
Case studies	2	10	12
Laboratory practical	13	39	52
Lecturing	4	20	24
Laboratory practical	8	26	34
Problem and/or exercise solving	1	0	1
Problem and/or exercise solving	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	Practical demonstrations. A1, A2, B8, C2, C3, C5, C13.

Laboratory practical	Setting and measure of circuits and telecommunication systems. Employing specific instrumental. In groups. A1, A2, B8, C2, C3, C5, C13.
Lecturing	Explanation of the theoretical-practical basis of the work to be developed by the students in the laboratory. A1, A2, B8, C2, C3, C5, C13.
Laboratory practical	Practical demonstrations. A1, A2, B8, C2, C3, C5, C13.

Personalized assistance

Methodologies	Description
Laboratory practical	Doubts may be solved in the tutorial classes. These will take place in the following way: * Individually or in small groups (typically with a maximum of 2-3 people). * Unless the contrary is specified, previous appointment with the professor will be required. The appointment will be requested and acknoledged by email or else at moovi.uvigo.gal. Place and time will preferrably be as officially scheduled.
Lecturing	Doubts may be solved in the tutorial classes. These will take place in the following way: * Individually or in small groups (typically with a maximum of 2-3 people). * Unless the contrary is specified, previous appointment with the professor will be required. The appointment will be requested and acknoledged by email or else at moovi.uvigo.gal. Place and time will preferrably be as officially scheduled.
Case studies	Doubts may be solved in the tutorial classes. These will take place in the following way: * Individually or in small groups (typically with a maximum of 2-3 people). * Unless the contrary is specified, previous appointment with the professor will be required. The appointment will be requested and acknoledged by email or else at moovi.uvigo.gal. Place and time will preferrably be as officially scheduled.

Assessment

	Description	Qualification		Training and Learning Results
Laboratory practical	Laboratory practises 1	20		C2 C3 C5 C13
Laboratory practical	Laboratory practices 2	30		C2 C3 C5 C13
Problem and/or exercise solvingMidterm 1		10	A1 A2	B8
Problem and/or exercise solvingMidterm 2		40	A1 A2	B8

Other comments on the Evaluation

ORDINARY CALL:

Two assessment systems are offered:

CONTINUOUS ASSESSMENT, that is the ordinary recommended method, around which educational activities are scheduled.SINGLE ASSESSMENT, which is recommended for those situations in which it results impossible to follow the ordinary method
CONTINUOUS ASSESSMENT
The continuous assessment consists of the proofs that detail to continuation:* Laboratory practices. Group assessment (Weight: 50%)* Proof of short answer. Individual assessment (Weight: 50%)
Attendance to the laboratory practices is considered as compulsory.
At the end of each practice session the students must hand in a report, reflecting the results obtained, which constitutes the subject of assessment.

The students choose continous assessment whenever they assist to any practice session and hand in the report, after the first course month.

When group assessment, all group components will obtain the same mark, provided that their contribution in the compulsory attendance sessions is reasonably similar.

Missed quizzes and/or lab classes will not be rescheduled.

Continuous assessment is only available provided that the student has attended 50 % of the practice sessions

If continuous evaluation has been elected, the final grade cannot be not presented.

EXAM-ONLY ASSESSMENTThe exam-only assessment consists of:* Examination on laboratory practice. Individual assessment (Weight: 50%)* Proof of short answer. Individual assessment (Weight: 50%)
SECOND CALL:The student been evaluated by Continuous Assessment 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 ASSESSMENT* Be evaluated with an only final examination in the official date assigned by the Centre, as the stipulated for the system of EXAM-ONLY ASSESSMENT.
The student not been evaluated by continuous Assessment:* will be evaluated with an only final examination in the official date assigned by the Centre, as the stipulated for the system of EXAM-ONLY ASSESSMENT

END OF PROGRAM CALL:

End of program calls will be assessed as stated in the above section Students who choose for exam-only assessment.

In the event of copycatting at any proof or work, the final assessment will be FAIL (0) and the event will be communicated to the Centre headmaster in order to conduct appropriate measures.

Sources of information
Basic Bibliography
Walter Tuttlebee, **Software defined radio : Enabling technologies**,
Fuqin Xiong, **Digital modulation techniques**,
Complementary Bibliography
Ulrich Reimers, **DVB : The family of international standards for digital video broadcasting**,
M. E. Van Valkenburg, **Network analysis**,
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**,

Recommendations
Subjects that continue the syllabus
Wireless and Mobile Communications/V05M145V01313
Satellites/V05M145V01311
Wideband Radio Systems/V05M145V01312

Subjects that are recommended to be taken simultaneously
Antennas/V05M145V01208
Optical Communications/V05M145V01207
Electronics and Photonics for Communications/V05M145V01202

Subjects that it is recommended to have taken before
Radiocommunication/V05M145V01103
Signal Processing in Communications/V05M145V01102