Universida_de_Vigo

IDENTIFYING DATA
Wireless Systems and Networks

Subject	Wireless Systems and Networks			
Code	V05G301V01326			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Pérez Fontán, Fernando			
Lecturers	Pérez Fontán, Fernando			
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General description	(*)(*) A general overview of current wireless communications systems will be provided including standards and dimensioning issues.			

Training and Learning Results

Code	
B2	CG2: The knowledge, comprehension and ability to apply the needed legislation during the development of the Technical Telecommunication Engineer profession and aptitude to manage compulsory specifications, procedures and laws.
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.
B7	CG7: The ability to analyze and assess the social and environmental impact of technical solutions.
C21	CE21/ST1 The ability to construct, exploit and manage telecommunication networks, services, process and applications, considered as systems of receiving, transporting, representation, processing, storage, management and presentation of multimedia information from the point of view of transmission systems.
C22	CE22/ST2 The ability of applying the basic techniques of telecommunication networks, services and applications for mobile and fixed environments, personal, local or long distance, with different bandwidth, including telephony, radio broadcasting, TV and data, from the point of view of transmission systems.
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.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
Cellular and wireless network specifications.	B7	C22	
To apply previously acquired knowledge on wave propagation for the planning of radio networks.		C21	
To specify the various elements (antennas, transmitters and receivers) which make up a global system.	B2	C25	D2
Provide access solutions to communications systems.	B4	C22	
Develop roll-out models which minimize the social and environmental impact of the radio communication networks, understanding the ethic and moral responsibilities involved in such work.	B2	C22	D2

Contents

Topic	
Theory 1. Introduction to radiocommunications	Basic concepts Current situation

Theory 2. Cellular systems	Fundamental concepts
	The radio propagation channel
	Multiple access techniques
	Interference
	Network sizing up
	Countermeasures
	Medium access control. Security and access control.
	Network management. Mobility management. Quality of service.
Theory 3. Review of cellular and wirelss lan standards and other proposals	Cell network generations.
	Evolution for the technological solutions in each generation.
Tutored work 1. Introduction to multipath effects	Reproducing multipath fading
	Doppler effect
	Narrow and wideband channel
Lab. 1. Introduction tho the radio channel	Statistical representation.
Lab 2. Channel effects on 3G	DS-SS
Lab 3. Introduction to 4G standard LTE	OFDMA

Planning

	Class hours	Hours outside the classroom	Total hours
Mentored work	7	14	21
Problem solving	6	18	24
Practices through ICT	14	28	42
Introductory activities	1	0	1
Lecturing	12	0	12
Objective questions exam	1	0	1
Report of practices, practicum and external practices	0	8	8
Problem and/or exercise solving	1	0	1
Essay	0	14	14

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

Methodologies

	Description
Mentored work	INDIVIDUAL. Simulation work to be carried out in Matlab language will be proposed to C class gropus where they will go deeper into specific issues discussed in less detail in the theoretical classes. Through this methodology the competencies CG2, CG4, CG7, CT2 and CE21
Problem solving	INDIVIDUAL.The theoretical treatment of the various topics studied in theoretical classes will be complemented by performing numerical calculations relative to radio network dimensioning. Through this methodology the competencies CG2 and CE22
Practices through ICT	INDIVIDUAL. In laboratory sessions (type B) various Matlab simulations will be proposed to the students in order to study specific topics which are more suitably aproached this way. Through this methodology the competencies CE21, CE22 and CE25
Introductory activities	In the course of the explanations provided in the lectures as well as during lab work or supervised work mention will be made to concepts already presented in earlier lectures from previous years
Lecturing	INDIVIDUAL. In classroom lectures the more theoretical issues will be presented. Through this methodology the competencies CE21, CE22, CE25 and CT2

Personalized assistance

Methodologies	Description
Lecturing	The student will be able to consult individually during tutoring hours all his/her doubts arising during the study of the theoretical contents as well as in the resolution of numerical exercises, laboratory work and supervised projects
Mentored work	The student will be able to consult individually during tutoring hours all his/her doubts arising during the study of the theoretical contents as well as in the resolution of numerical exercises, laboratory work and supervised projects
Problem solving	The student will be able to consult individually during tutoring hours all his/her doubts arising during the study of the theoretical contents as well as in the resolution of numerical exercises, laboratory work and supervised projects
Practices through ICT	The student will be able to consult individually during tutoring hours all his/her doubts arising during the study of the theoretical contents as well as in the resolution of numerical exercises, laboratory work and supervised projects
Introductory activities	In the same way as with the above points, personalized attention will be provided to the students in all aspects related to introductory activities.

Assessment

	Description	Qualification	Training and Learning Results
Objective questions exam	Adequate knowledge of the theoretical materials of the lecture will be assessed by means of short response questions during an Intermediate Test and at the Final Exam. Each of these tests has a weight of 1/2. Continued class attendance will be evaluated.	20	C21 D2 C22 C25
Report of practices, practicum and external practices	For each lab assignment, the students individually, will present a written report. The evaluation will be carried out by means of (1) reports, (2) an specific mid-term test and (a) at the final exam. The weights of these 3 parts will be 1/3. Continued class attendance will be evaluated.	30	C21 D2 C22 C25
Problem and/or exercise solving	In a mid-term test and at the final exam, there will be a part containing various short numerical problems. Each of these 2 tests will weight 1/2. Continued class attendance will be evaluated.	30	B2 C21 C22 C25
Essay	The evaluation of supervised group work (C classes) will be carried out through (1) a report, (2) a specific min-term test and (3) a specific test at the Final Exam. Each of these two evaluation mechanisms has a weight of 1/2. That is 1/2 for the reports and 1/4 for the specific mid term test and 1/4 for the final exam test. Continued class attendance will be evaluated.	20	B4 C21 B7 C22 C25

Other comments on the Evaluation

English Friendly subject: 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.

If possible all skills pertaining to this subject will be evaluated in all the various tests and exercises proposed: short answer tests, lab reports, problem solving and projects**ORDINARY EXAM**

For the Ordinary Opportunity, the Continuous Assessment option will be carried out according to the Table above. Note that should one chose Continuous Evaluation, it will be compulsory to carry out all the Lab Work proposed (Groups B) and the Supervised Projects (Groups C). A mid-term exam will be taken consisting of 4 Intermediate Tests: Short Questions, Problems, Groups B and Groups C. The overall value of this exam will be 40% of the overall mark. For the Final Exam the same 4-test structure will be followed. Again, the overall weight of this exam will be 40% of the overall mark. Further, the overall mark will be complemented with the assessment of the Lab Work and Supervised Project Reports, both with a weight of 10%.

Those who chose Global Evaluation will be assessed through a Final Exam with a weight of 100% of the overall mark with 4 different parts similar in structure to the Intermediate Test and Final Test for the Continuous Evaluation case. For this option, it is not compulsory to carry out the Lab Work and Supervised Projects.

The schedule of the midterm/intermediate exams will be approved in the Comisión Académica de Grado (CAG) and will be available at the beginning of each academic semester.

The marks achieved for the Lab Work and Supervised Project Reports are only valid during the current academic year.

Should the student chose the Global Evaluation option, this will be reported to the professor, otherwise it will be assumed by default that the student has opted for the Continuous Evaluation option. The student going for this Conunyuous Evaluation option must carry out all Lab Work and Supervised Project tasks proposed. Change to Global Evaluation can b chosen at any time during the semester. This should be duly notified to the professor.

EXTRAORDINARY AND END-OF-PROGRAM EXAM

Extraordinary Exam will involve a Final exam for all option: Continuous and Global Evaluation, as well as for End-of-Term. In the case of Continuous Evaluation, the marks for the Lab Work and Supervised Project Reports will be added to the overall mark.

ETHICS CODE

Should a case of plagiarism be detected in any of the various activities and tests , the final mark will be FAILED (0) and the school direction team will be advised on the fact.

Sources of information
Basic Bibliography
José María Hernando Rábanos, **Comunicaciones Móviles. 2ª ed.**, Ed. Centro de Estudios Ramón Areces, S.A., 2014

F.Pérez-Fontán and P.Mariño Espiñeira, **Modeling of the wireless propagation channel. A simulation approach with Matlab**, Wiley, 2008

Oriol Sallent Roig, Jordi Pérez Romero, **Fundamentos de diseño y gestión de sistemas de comunicaciones móviles celulares**, UPC, 2014

Complementary Bibliography

Fernando Pérez Fontán, Sigfredo Pagel Lindow, **Introducción a las. Comunicaciones Móviles**, Servicio de Publicaciones. Universidad de Vigo, 1997

José María Hernando Rábanos, **Comunicaciones Móviles de Tercera Generación**, Telefónica Móviles, 2000

Simon R. Saunders, **Antennas and Propagation for Wireless Communications Systems**, Wiley, 2007

José María Hernando Rábanos, Fernando Pérez Fontán, **Introduction to Mobile Communications Engineering**, Artech House, 1999

Ramón Agustí Comés, **LTE: nuevas tendencias en comunicaciones móviles**, Fundación Vodafone, 2010

Recommendations

Subjects that it is recommended to have taken before

Radio Frequency Circuits/V05G301V01319
Radio Communication Systems/V05G301V01320