IDENTIFYING DATA

Wireless Systems and Networks

Subject	Wireless Systems and Networks
Code	V05G300V01615
Study programme	Degree in Telecommunications Technologies Engineering

Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd

Teaching language	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.

Competencies

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.

Learning outcomes

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 Wireless LANs Personal networks.
Theory 2. Cellular systems	Fundamental concepts The radio propagation channel Multiple access techniques Interferencr Traffic theory 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	2nd generation systems Evolution of 2G systems 3rd generation systems Beyond 3G WLAN systems Other systems and proposals Cognitive access Femtocells.
Lab 1. Statistical analysis of simulated and/or measured time-series	Analysis of simulated and/or experimental time-series
Lab 2. Introduction to multipath effects	Reproducing multipath fading Doppler effect Narrow and wideband channel
Lab 3. Introduction of blockage/shdowing effects	Simulation of the shadowing effect Call handover Interference

Planning

	Class hours	Hours outside the classroom	Total hours
Tutored works	7	14	21
Troubleshooting and / or exercises	6	18	24
Practice in computer rooms	14	28	42
Master Session	13	26	39
Short answer tests	1	0	1
Reports / memories of practice	0	8	8
Troubleshooting and / or exercises	1	0	1
Jobs and projects	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
Tutored works	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
Troubleshooting and / or exercises	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
Practice in computer rooms	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
Master Session	In classroom lectures the more theoretical issues will be presented. Through this methodology the competencies CE21, CE22, CE25 and CT2

Personalized attention

Methodologies	Description
Master Session	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
Tutored works	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

	Troubleshooting and / or exercises	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
	Practice in computer rooms	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

Assessment

	Description	Qualification	Training and Learning Results	
Short answer tests	Adequate kowledge of the theoretical materials of the lecture will be assessed by means of short response questions during the final exam. A minimum mark of 4 over 10 points may be set for this part.	25	C21 C22 C25	D2
Reports / memories of practice	For each lab assignment, the students in pairs, will present an individual written report. The evaluation will be carried out by means of (1) the individual reports and (2) an specific part in the final exam. The weights of parts one and two will be 1/3 and 2/3, respectively.	25	C21 C22 C25	D2
Troubleshooting and / or exercises	In the final exam, there will be a part containing various short numerical problems. A minimum mark of 4 over 10 points may be set for this part.	25	B2 C21 C22 C25	
Jobs and projects	The evaluation of supervised group work (C classes) will be carried out through an individual report where each student wll present his/her conclusions and test results.	25	B4 C21 B7 C22 C25	

Other comments on the Evaluation

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

For those who choose to take the final exam (alternatively to continuous assessment), this will have a weight of 100% of the final grades and will cover all issues dealt with in the theoretical lectures, the problem solving lectures, tutored group work and laboratory.

Above the procedure for carrying out the continuous assessment was presented. The final grades will be the result of four equal weight parts, namely

- a theoretical test consisting of short questions (25%) to take place during the final exam,

- a problem solving test consisting of short numerical calculations (25%) to take place during the final exam,

- the completion of the laboratory work and corresponding reports and specific test in the final exam (25%) and

- the completion of the proposed tutored group work, its corresponding report and oral presentation (25%)

In case a minimum mark was set for any of the parts comprising the overall evaluation and such mark were not achieved, the final grade will be upper bounded by such minimum mark.

The grades for the lab. work and group work will only be valid during the current school year.

Those students who choose the continuous assessment option shall inform the professor of this during the first few weeks of the school term. The continuous assessment option entails the completion of all activities proposed: lab works and group work, and taking all tests comprising the continuous assessment route. Those students not fulfilling the above will be assessed with the final exam only.

A student will be atributed the "no presentado" grade if he or she has not followed the full continuous assessment route and has not taken the final exam.

For the retake call (July), the grades obtained in the lab work and group work parts will be kept for those students following the continous assessment route and will only be required to take the theory, problems and lab parts of the new final exam.

Sources of information
Basic Bibliography

José María Hernando Rábanos, **Comunicaciones Móviles. 2ª ed.**, Ed. Centro de Estudios Ramón Areces, S.A.,

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

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

Complementary Bibliography

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

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

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

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

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

Recommendations

Subjects that it is recommended to have taken before

Physics: Fields and Waves/V05G300V01202
Mathematics: Probability and Statistics/V05G300V01204
Fundamentals of Sound and Image/V05G300V01405
Digital Signal Processing/V05G300V01304
Signal Transmission and Reception Techniques/V05G300V01404
Electromagnetic Transmission/V05G300V01303
Radio Frequency Circuits/V05G300V01511
Radio Communication Systems/V05G300V01512