



IDENTIFYING DATA

(*)Principios de comunicacións dixitais

Subject	(*)Principios de comunicacións dixitais			
Code	V05G300V01613			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish English			
Department				
Coordinator	González Prelcic, Nuria			
Lecturers	González Prelcic, Nuria Márquez Flórez, Óscar Willian			
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General description	(*)Os obxectivos básicos da materia son os seguintes: - Aplicar criterios de optimización para a realización de esquemas de estimación e sincronización en receptores dixitais de comunicacións. - Diferenciar os bloques e as funcionalidades dun sistema de transmisión de datos completo. - Utilizar o procesado dixital de sinais para transmitir e recibir formas de onda analóxicas - Aplicar os mecanismos básicos de redución do impacto de ruído nun sistema de comunicacións.			

Competencies

Code	
A3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
A4	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.
A35	CE26/ST6 The ability to analyze, codify, process and transmit multimedia information using analogical and digital signal processing techniques.
B2	To approach a new problem considering first the essential and then the secondary aspects

Learning aims

Expected results from this subject	Training and Learning Results
CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations	A3
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.	A4
CE26/ST6 The ability to analyze, codify, process and transmit multimedia information using analogical and digital signal processing techniques.	B2
CG11: To approach a new problem considering first the essential and then the secondary aspects	A35

Contents

Topic	
1. Introduction to digital communications.	- The software radio concept. - Elements of a digital receiver. - Quality objectives in a digital receiver

2. Timing recovery	<ul style="list-style-type: none"> - Introduction to the problem. - Decision directed timing recovery. - Timing recovery via Output Power maximization.
3. Carrier recovery.	<ul style="list-style-type: none"> - Phase estimation with known frequency. - The Phase Locked Loop. - The Costas Loop. - Decision directed phase tracking. - Frequency tracking.
4. Equalization	<ul style="list-style-type: none"> - Equivalent discrete time channel. - Least Squares (LS) equalization. - Adaptation algorithms: trained, decision directed, blind.
(*)5. Codificación de canle.	<ul style="list-style-type: none"> (*)- Medida da información. Entropía. - Capacidade de canle. - Codificación de canle. Ganancia de codificación.
5. Coding	<ul style="list-style-type: none"> - Entropy. - Channel capacity. - Channel coding. Coding gain.

Planning

	Class hours	Hours outside the classroom	Total hours
Troubleshooting and / or exercises	4	12	16
Laboratory practises	12	36	48
Projects	7	35	42
Master Session	17	25	42
Long answer tests and development	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
Troubleshooting and / or exercises	Some of the proposed problems for each topic will be solved in class.
Laboratory practises	The concepts presented in class will be further illustrated and developed by means of Matlab-based simulation and signal processing tools
Projects	Development of a complete PAM and QAM modem in Matlab. Work in small groups.
Master Session	Presentation and discussion of the fundamental theory

Personalized attention

Methodologies	Description
Master Session	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.
Laboratory practises	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.
Projects	Student aid will be provided during office hours as well as on-line (email, chat). On-line discussion forums will be set up for each chapter, through the usual e-learning platform.

Assessment

	Description	Qualification
Laboratory practises	Three short tests will be given during the semester	30
Projects	The project will be evaluated at the end of the semester.	20
Long answer tests and development	Final exam.	50

Other comments on the Evaluation

For those students that opt for continuous evaluation:

- Final Exam: 50%

- Several short tests: 30% (approximately in weeks 5, 9 and 14). Results will be announced within a reasonable time. If a student does not show up, the instructors have no obligation to reschedule the test for him/her. Each short test will cover the material from the beginning of the semester to the previous week.

- Project: 20%

For those students that do not opt for continuous evaluation:

- Final Exam: 100%

Any student showing at any of the tests (short tests or final exam) will be assigned a grade. Any student showing at any of the short tests will be graded under the continuous evaluation format. The grade of any student that only shows at the final exam will be the grade of the final exam.

The student may opt out of the continuous evaluation after the second short test, communicating his/her choice to the instructors within a deadline. Students that choose the continuous evaluation format at that point and do not pass the course will be assigned the grade "fail" regardless of any potential no-shows.

The short tests grades will be kept for the second call, if the case, but they will not be kept for future years. In the second call, students will be allowed to opt out of the continuous evaluation format.

Sources of information

C. R. Johnson Jr y W. A. Sethares, **Telecommunication breakdown: Concepts of communication transmitted via software-defined radio**,

J.R. Barry, E. A. Lee y D. G. Messerschmitt, **Digital communication**,, 3rd edition,

A. Artés Rodríguez, F. Pérez González y otros,, **Comunicaciones Digitales**,

Recommendations

Subjects that it is recommended to have taken before

(*)Técnicas de transmisión e recepción de sinais/V05G300V01404

(*)Tratamento de sinais multimedia/V05G300V01513
