Universida_{de}Vigo

Subject Guide 2015 / 2016

IDENTIFYIN				
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Subject	(*)Tratamento de Sinal en			
	Comunicacións			
Code	V05M145V01102			
Study	(*)Máster Universitario en			
programme	Enxeñaría de			
	Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Ouadmester
Descriptors	5	Mandatory	1st	1st
Teaching	Spanish	Manuatory	131	150
language	Spanish			
Department				
	López Valcarce, Roberto			
Lecturers	López Valcarce, Roberto			
E-mail	valcarce@gts.uvigo.es			
Web	http://faitic.uvigo.es			
General	This course presents several of the signal processi	na techniques most a	commonly found	d in the design and
description	implementation of communication systems, with fo			
ucscription	sampling and quantization, block and adaptive est			
	filtering methods.	and and the state of the state	om county, cm	ciciic resumpling und
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Competencies

- CG4 The capacity for mathematical modeling, calculation and simulation in technological centers and engineering companies, particularly in research, development and innovation tasks in all areas related to Telecommunication Engineering and associated multidisciplinary fields.
- 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.
- CE1 The ability to apply methods of information theory, adaptive modulation and channel coding, as well as advanced techniques of digital signal processing systems and audiovisual communications.
- CE2 The ability to develop radio communication systems: antenna, equipment and subsystems design; channel modeling; link budgeting; and planning.
- CE3 The ability to implement systems by cable, line, satellite, in fixed and mobile communication environments.

Learning outcomes		
Expected results from this subject	Training and	
	Learning Results	
(*)Conocimiento de los principales modelos de la mecánica de fluidos		
Ability to apply multirate processing, adaptive filtering, block-based transform and spectral estimation	B4	
techniques to communication and multimedia systems	C1	
Ability to implement advanced signal processing techniques in diverse fields of application:	B4	
bioengineering, bioinformatics, etc.	B8	
Ability to apply signal processing techniques to the modeling and simulation of communication systems	B4	
	C1	
	C2	
Ability to simulate the physical layer of cable, wireline, satellite systems in fixed/mobile communication		
environments.	B8	
	C2	
	C3	

Contents

- DFT: formulation and properties.
- Frequency Analysis based on DFT. Windowing.
- DFT-based digital modulation schemes: DMT, OFDM.
- DCT: formulation and properties.
- Transform domain coding.
- Aliasing
- Baseband and bandpass sampling
- Quantization noise
- Converter overload
- Spurious-free dynamic range
- Sampling jitter
-Experimental study of the diverse effects and tradeoffs involved in the
design of the transmitter and receiver of a multicarrier communication
system.
- Minimum Mean Squared Error criterion
- LMS adaptive filters
- Least Squares criterion
- Power spectral density estimation: Welch's periodogram
- LMS and NLMS Algorithms
- Simulation in a channel equalization context
- Simulation in an echo/interference cancellation context
- Sampling rate conversion: decimation, interpolation, multirate filters
- Filter Banks: framework, classes. The DFT as a filter bank. Wavelet
transform and application to image coding.
- Efficient implementation: polyphase decomposition. Filter banks as
transmultiplexers.
- The student will develop the design of a signal processing system
involving several aspects covered during the course, and meeting a series
of specifications/requirements.

Planning			
	Class hours	Hours outside the classroom	Total hours
Master Session	18	18	36
Laboratory practises	20	20	40
Autonomous practices through ICT	0	40	40
Long answer tests and development	2	0	2
Reports / memories of practice	0	5	5
Jobs and projects	0	2	2

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

Methodologies	
	Description
Master Session	Presentation of main topics, possibly with audiovisual aids. Applied/theoretical problem sessions.
Laboratory practises	Under the guidance of the instructor, the student will develop the design and/or simulation of a signal processing system involving several of the techniques studied during the course.
Autonomous practices through ICT	Computer-based simulation of signal processing applications to communications and multimedia.

Personalized attention		
Methodologies	Description	
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	
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	

Assessment				
	Description	Qualification Training and		ining and
			Learn	ing Results
Long answer tests and	Final test in which the student must solve a series of	40	В4	C1
development	exercises.			C2
Reports / memories of practice Written reports corresponding to the different lab		40	B4	C1
	assignments.		В8	C2

Jobs and projects	Written report describing the developed design and obtained	20	B4	C1
	results for the final project.		B8	C2
				C3

Other comments on the Evaluation

Students may choose one of the following two assessment options:

- 1) Continuous assessment: Final grade will consist of:
- comprehensive test (up to 4 points)
- lab reports (up to 4 points)
- final project (up to 2 points)

A minimum grade of 30% in the comprehensive test is required in order to pass the course.

Lab report grades from the first call will be kept for the second call, in which the student will be allowed to resubmit the final project and/or take a new comprehensive test.

2) One-shot assessment: The final grade is the one achieved in the comprehensive test, for both the first and second call.

Any kind of plagiarism will result in automatically failing the course.

Sources of information

- T. K. Moon, W. C. Stirling, Mathematical methods and algorithms for signal processing, 1st,
- S. Mitra, Digital Signal Processing: A Computer Based Approach., 4th,

Behrouz Farhang-Boroujeny, Signal Processing Techniques for Software Radios, 2nd,

- P.P. Vaidyanathan, Multirate systems and Filter Banks,
- F. Harris, Multirate Signal Processing for Communication Systems,
- J.G. Proakis and D.G. Manolakis, Digital Signal Processing, 4th,
- S. Haykin, **Adaptive Filter Theory**, 4th,

The instructors will make available to the students via Faitic all relevant materials related to the course (slides, class notes, etc.)

Recommendations