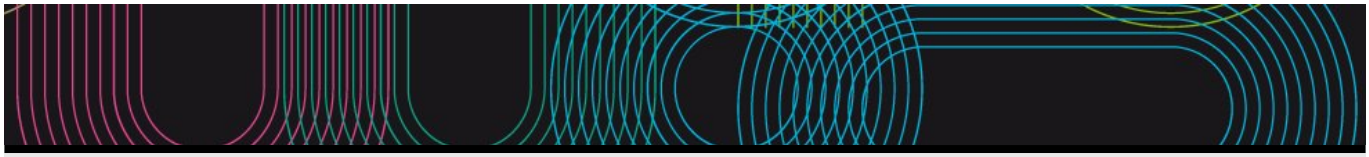

IDENTIFYING DATA				
(*)Tratamento de Sinal en Comunicacións				
Subject	(*)Tratamento de Sinal en Comunicacións			
Code	V05M145V01102			
Study programme	(*)Máster Universitario en Enxeñaría de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	López Valcarce, Roberto			
Lecturers	López Valcarce, Roberto			
E-mail	valcarce@gts.uvigo.es			
Web	http://faitic.uvigo.es			
General description	This course presents several of the signal processing techniques most commonly found in the design and implementation of communication systems, with focus on digital processing schemes. Covered aspects include sampling and quantization, block and adaptive estimation, block transform coding, efficient resampling and filtering methods.			

Competencies	
Code	
B4	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.
B8	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.
C1	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.
C2	CE2 The ability to develop radio communication systems: antenna, equipment and subsystems design; channel modeling; link budgeting; and planning.
C3	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 techniques to communication and multimedia systems	B4 C1
Ability to implement advanced signal processing techniques in diverse fields of application: bioengineering, bioinformatics, etc.	B4 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.	B4 B8 C2 C3

Contents
Topic

Chapter 1: Block-based Transforms in Communications and Multimedia	- DFT: formulation and properties. - Frequency Analysis based on DFT. Windowing. - DFT-based digital modulation schemes: DMT, OFDM. - DCT: formulation and properties. - Transform domain coding.
Lab Assignment 1: Sampling and quantization	- Aliasing - Baseband and bandpass sampling - Quantization noise - Converter overload - Spurious-free dynamic range - Sampling jitter
Lab Assignment 2: Simulation of a multicarrier-based digital communication system	-Experimental study of the diverse effects and tradeoffs involved in the design of the transmitter and receiver of a multicarrier communication system.
Chapter 2: Adaptive Filtering and Estimation	- Minimum Mean Squared Error criterion - LMS adaptive filters - Least Squares criterion - Power spectral density estimation: Welch's periodogram
Lab Assignment 3: Adaptive Filtering	- LMS and NLMS Algorithms - Simulation in a channel equalization context - Simulation in an echo/interference cancellation context
Chapter 3: Multirate Processing and Filter Banks	- 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.
Final Project	- 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 Learning Results	
Long answer tests and development	Final test in which the student must solve a series of exercises.	40	B4	C1 C2
Reports / memories of practice	Written reports corresponding to the different lab assignments.	40	B4 B8	C1 C2

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