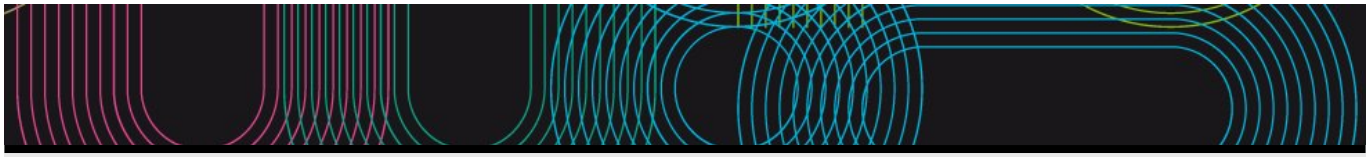

IDENTIFYING DATA				
Multimedia Signal Processing				
Subject	Multimedia Signal Processing			
Code	V05G300V01513			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	1st
Teaching language	Spanish			
Department	Signal Theory and Communications			
Coordinator	Docampo Amoedo, Domingo			
Lecturers	Cardenal López, Antonio José Docampo Amoedo, Domingo			
E-mail	ddocampo@uvigo.es			
Web	http://http://faitic.uvigo.es/			
General description	Multimedia signal processing is now a fundamental part of any modern information, communication, learning, and entertainment system. Once the main Digital Signal Processing concepts and bases have been introduced in the second year, this course prepares students for the analysis and processing of deterministic and random signals, before encoding and transmission of multimedia information. In related courses both on this and next academic year, the knowledge acquired shall be applied to voice, audio, image and video signals and systems,. The main goals of the course are: □ Analyze digital signal processing schemes. □ Design digital filters according to prescribed specifications. □ Analyze and specify the basic parameters of communication subsystems from the point of view of signal processing. □ Apply statistical filtering in coding, processing and transmission of multimedia information. To help in reaching these goals, the course is divided into four major topics: DFT and Fast Fourier Transform, Fundamentals of statistical signal processing, digital filter characterization and multirate signal processing.			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
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.
C26	CE26/ST6 The ability to analyze, codify, process and transmit multimedia information using analogical and digital signal processing techniques.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Analyze digital signal processing diagrams.	B3	C26	
Design digital filters from specifications.	B4	C26	D2

Analyze and specify the fundamental parameters of the communication subsystems from the point of view of digital signal processing.	B4	C26	
Statistical analysis and filtering applied to the coding, processing and transmission of multimedia information.	B3 B4	C26	D3

Contents

Topic	
Practice 1 Fourier Analyses through DFT.	Linear Filtering using DFT. Effects of the temporal and frequency sampling. Windowing and spectral resolution
Topic 1 Fourier Transform of discrete signals: DFT.	Formulation and properties of the DFT. Efficient computation of the DFT (FFT). Linear Filtering Methods using DFT. Effects of the time and frequency sampling. Windowing and spectral resolution.
Topic 2 Introduction to Statistical signal processing.	Random signals. Correlation and spectra for stationary signals. Random signals and linear systems. Optimal Linear Filters. Wiener filter. Introduction to adaptive filtering: LMS algorithm. Spectral Estimation.
Practice 2 Adaptive Filtering.	Wiener Filter. LMS.
Topic 3 Filter Design and implementation.	Z transform: a review. Implementation of FIR and IIR filters from difference equations. Block Diagramas. Structures for digital filters. FIR and IIR Design.
Practice 3 Digital Filters Design and implementation.	FIR filters Design. IIR filters Design.Implementation of digital filters.
Topic 4 Multirate signal processing.	Decimation and Interpolation. Spectral interpretation of interpolation and decimatio. FIR Filter Structures Based on Polyphase Decomposition. Filter Banks.
Practice 4 Multirate signal processing.	Decimation and Interpolation. Polyphase Filter Banks.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practices	12	24	36
Supervised work	7	35	42
Lecturing	21	42	63
Essay questions exam	2	7	9

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

Methodologies

	Description
Laboratory practices	Application of MatLaB commands and functions to digital signal processing practical exercises. Through this methodology the competencies CG4, CE26, CT2 and CT3. are developed. (Individual)
Supervised work	Group work on a project centered in a practical application of signal processing. Through this methodology the competencies CG3, CG4, CE26, CT2 and CT3 are developed. (Group)
Lecturing	Presentation of main topics in class. Multimedia material will be made available in faitic before classes take place. Personal study. Support from the instructors through tutorial help. Through this methodology the competencies CG3, CE26, CT2 and CT3. are developed. (Individual)

Personalized attention

Methodologies	Description
Lecturing	Lectures take place within a continuous interaction framework in which students may answer questions formulated by the teacher. They could also solve their particular doubts during the sessions.
Laboratory practices	In practical sessions students are required to carry on their own the assigned task. The instuctorr will be available during the session to solve any problems/questions students may have.
Supervised work	Tutored works are carried out in small working groups. The follow up of the work in progress takes place in regular meetings between the groups and the instructor, in which students may formulate any questions related to the work to be done.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practices	Individual drills related with the laboratory content. Will be taken in laboratory time, and will last 30 minutes.	40	B3 B4	D3

Supervised work	Projects to be carried out in groups. Different gradings according to levels of participation that will be assessed through cross- evaluation surveys among students.	20		C26	D2
Lecturing	Written exam encompassing all the material exposed in the classroom and laboratory .	40	B3 B4		

Other comments on the Evaluation

Evaluation

Following the guidelines of the degree, students shall be offered two evaluation systems: continuous evaluation or evaluation at the end of the semester.

- Continuous evaluation.
- Unique Evaluation.
- Recovery in the month of June-July.

CONTINUOUS EVALUATION

The continuous evaluation of the course will consist in:

- Four 30-minutes drills related to the laboratory work, that will account for 40% of the final grade.
- One project to be carried out in a group that will account for 20% of the final grade.
- A written exam encompassing all the material exposed in the classroom and laboratory. Will take place on the dates scheduled by the School. The exam shall help in gauging the level of understanding of the four-course topics. The exam will feature exercises and questions to be answered in two hours. Students may bring to the exam books, laboratory and classroom notes, and any other materials downloaded from faitic. The exam will account for 40% of the final grade.

The final qualification of the student will be computed as a weighted sum (40%, 20%, and 40%, respectively) of the qualifications of the laboratory, group project, and final exam. However, in order to pass the course, the grade of the final exam must not lie below 25 out of 100 points. If that grade is lower than 25, the final qualification will be the minimum among the aforementioned weighted sum and 4.5.

The contents and weights of each continuous evaluation exercises are the following:

- Laboratory drill 1 (10 %):

Fourier Analysis through DFT: will take place in the fourth week of the course.

- Laboratory drill 2 (10 %)

Adaptive filtering: will take place in the sixth week of the course.

- Laboratory drill 3 (10 %):

Design and implementation of FIR and IIR filters: will take place in the tenth week of the course.

- Laboratory drill 4 (10 %):

Multirate Filter Banks: will take place in the thirteenth week of the course.

- Project: (20%) practical application of concepts mastered in the course. Oral presentations shall take place in the fourteenth week of the course.

The planning of the different intermediate evaluation tests will be approved in an Academic Committee of Degree (CAG) and will be available at the beginning of the semester.
UNIQUE EVALUATION

Should a student decide not to be graded through continuous evaluation, she will have a written examination opportunity that will take place the same day of the final exam for all the students. Before taking the exam though, the student shall sign a form in which he states his decision to dispense with continuous evaluation.
This written exam will last three hours and will be composed of 5 exercises encompassing all the material mastered in the

classroom, laboratory, and tutorial sessions, under the same conditions specified for the students that take the final exam at the end of the continuous evaluation process.

Grading Periods

First opportunity to pass the course (December-January)

If the student passes the course in this period, her grade will be final and will be recorded in her academic file.

If the student does not pass the course, a provisional fail shall be posted in his academic file.

Second opportunity to pass the course (June-July)

In June-July only the written exams shall be offered. If a student wants to dispense with continuous evaluation in this period, the student will be able to take the final exam reserved for those cases. Before taking the exam though, a form shall be signed, in which the student formulates the decision to dispense with continuous evaluation.

The provisional fail will become definitive should the student not take any of the written exams in this second period.

Sources of information

Basic Bibliography

John G. Proakis, Dimitris G. Manolakis., **Tratamiento Digital de Señales**, Prentice Hall,

Complementary Bibliography

Sanjit K. Mitra., **Digital Signal Processing: A Computer Based Approach.**, Ed. McGraw-Hill,

Alan V. Oppenheim, Ronald W. Schafer, **Discrete-Time Signal Processing**, Prentice Hall,

Recommendations

Subjects that it is recommended to have taken before

Digital Signal Processing/V05G300V01304