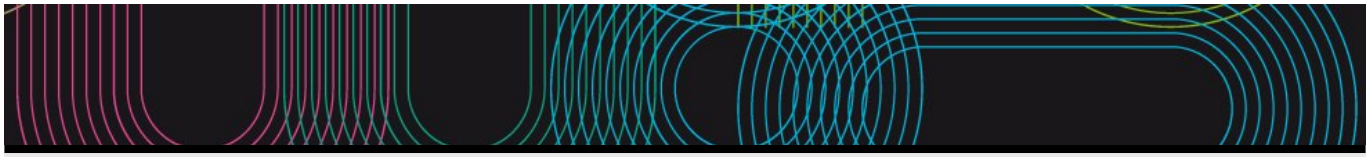
Universidade Vigo

Subject Guide 2015 / 2016



IDENTIFYING DATA				
(*)Procesado de Sinal en Tempo Real				
Subject	(*)Procesado de Sinal en Tempo Real			
Code	V05M145V01301			
Study programme	(*)Máster Universitario en Enxeñaría de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	2nd	1st
Teaching language	English			
Department				
Coordinator	Martín Herrero, Julio			
Lecturers	Martín Herrero, Julio			
E-mail	julio@uvigo.es			
Web				
General description	We deal with different architectures and techniques for realtime signal processing, including digital signal processors (DSP) and multicore computing platforms (CPUs and massively parallel GPUs). Standards such as OpenCL, OpenMP, PPL and AMP will be addressed. Our main focus will be on hands-on, practical work and the capability to adapt to new, emerging, constantly evolving technologies and tools.			

Competencies	
Code	
B1	CG1 The ability to project, calculate and design products, processes and facilities in telecommunication engineering areas.
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.
C21	CE21/PS1 Manage implementation of signal processing systems options to accelerate computationally complex algorithms.

Learning outcomes	
Expected results from this subject	Training and Learning Results
To handle advanced architectures for realtime signal and video processing	B1 B8 C21
To apply advanced techniques of DSP programming in realtime signal applications	B1 B8 C21
To understand the basic principles of realtime signal and video processing on standard GPUs and general purpose GPU	B1 B8 C21
To understand and apply the fundamentals of realtime application programming on graphic processing units, using multiplatform programming interfaces (OpenCL)	B1 B8 C21

Contents	
Topic	
High and low level DSP programming	High and low level DSP programming
GPU programming fundamentals	GPU programming fundamentals
General purpose programming of GPUs (GPGPU)	General purpose programming of GPUs (GPGPU)

OpenCL programming and integration in different architectures | OpenCL programming and integration in different architectures

Planning			
	Class hours	Hours outside the classroom	Total hours
Master Session	8	0	8
Practice in computer rooms	17	0	17
Projects	0	95	95
(*)Cartafol	0	0	0
Long answer tests and development	2	0	2
Practical tests, real task execution and / or simulated.	3	0	3
*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	General introductions to fundamental concepts
Practice in computer rooms	Individual hands-on work on computing platforms and/or simulators to implement and compare study cases
Projects	In-depth practical development of an application/algorithm according to the specific interests of each student
(*)Cartafol	

Personalized attention	
Methodologies	**Description**
Projects	Doubts will be solved and guidance provided for the autonomous work of the student during lab sessions and also in prearranged individual tutoring sessions
Practice in computer rooms	Doubts will be solved and guidance provided for the autonomous work of the student during lab sessions and also in prearranged individual tutoring sessions

Assessment				
	Description	Qualification	Training and Learning Results	
Long answer tests and development	Questions on general fundamental concepts of realtime signal processing	30	B1 B8	C21
Practical tests, real task execution and / or simulated.	Programming of realtime algorithms	70	B1 B8	C21

Other comments on the Evaluation

The assessment is continuous by default, based on the work carried on by the students during the lab classes and in their personal project. This can provide up to 100% of the final mark. There is an optional written final exam at the end of the period of classes, which can be used to raise the continuous evaluation mark, or as 100% of the qualification for those students not willing to follow the continuous assessment. Those students not succeeding in the first call will have access to a second call, where the whole mark will come out from the final written exam.

Sources of information

Sen M. Kuo, Bob H. Lee, Wenshun Tian, **Real-Time Digital Signal Processing**, 2,

Gerassimos Barlas, **Multicore and GPU Programming: An Integrated Approach**, 1,

Khronos Group, **The OpenCL specifications**, 2.0,

Matthew Scarpino, **OpenCL in Action**, 1,

Raymond Tay, **OpenCL Parallel Programming Development Cookbook**, 1,

Recommendations

Subjects that it is recommended to have taken before

(*)Tratamento de Sinal en Comunicacións/V05M145V01102