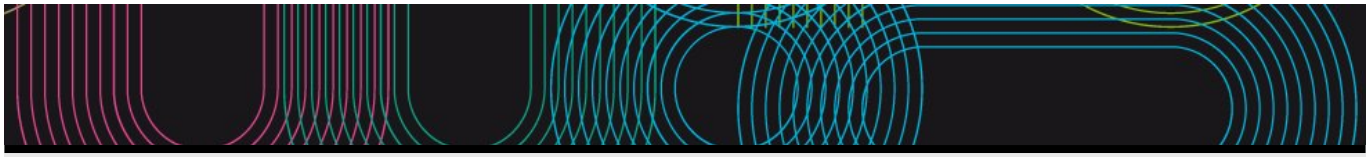

IDENTIFYING DATA				
Signal Processing in Audiovisual Systems				
Subject	Signal Processing in Audiovisual Systems			
Code	V05M145V01205			
Study programme	Máster Universitario en Ingeniería de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd
Teaching language	English			
Department				
Coordinator	Martín Rodríguez, Fernando			
Lecturers	Martín Rodríguez, Fernando			
E-mail	fmartin@uvigo.es			
Web	http://https://moovi.uvigo.gal/			
General description	In this course we will describe the main compression and coding techniques for audiovisual signals, paying special attention to MPEG4 standard. We will also explain the main characteristics of MPEG-7 standard for multimedia content description and retrieval.			

Training and Learning Results	
Code	
B1	CG1 Ability to project, calculate and design products, processes and facilities in telecommunication engineering areas.
B4	CG4 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.
C1	CE1 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.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
Learning to exploit perceptual effects and spatial/temporal redundancy to compress audiovisual information.	B1 B4 C1
Understanding information structure into the MPEG4 standard and the reasons because it is needed.	B1
Understanding main processes applied on audio and video signals to guarantee perceptual quality while reducing bitrate. Knowledge of the main algorithms that are part of standards.	B1 B4 C1
Learning to handle audiovisual information to extract metadata and to use them in indexing and retrieval.	B1
Understanding structure and usefulness of MPEG7 standard.	B1

Contents	
Topic	
Introduction to audiovisual compression and coding.	Human perception, redundancy and importance. Compression standards history. Analysis and description of spatial/temporal video structure.
Video coding.	Video compression standards: MPEG 1, 2 & 4; H.261, H.263, H.264 (AVC), H.264 extensions, introduction to HEVC (H.265, MPEG-H part 2).
Audio coding.	Audio compression standards: MPEG 1, 2, 4 (MP3, AAC).

Advanced audiovisual description.	MPEG7. Advanced audiovisual description. Multimedia content management. Information retrieval.
Practical content.	Each year, two practical work assignments will be done on themes related with theory contents.

Planning			
	Class hours	Hours outside the classroom	Total hours
Practices through ICT	10	30	40
Mentored work	10	50	60
Lecturing	8	8	16
Objective questions exam	1	0	1
Report of practices, practicum and external practices	0.5	3.5	4
Report of practices, practicum and external practices	0.5	3.5	4
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Practices through ICT	Working specific concepts from the theory (master) sessions. We will use computer tools. Related competencies: CG1, CG4, CE1. Software: Matlab, Simulink, Python/OpenCV.
Mentored work	Work about the explained concepts, sometimes going beyond. Normally, works are initiated in computer lab work and it will spread over more than one week. Students (in pairs), have to discover (on their own or with teacher assistance) what they need to solve the problem. Results (or at least, part of them) will be presented in public. Related competencies: CG1, CG4, CE1.
Lecturing	Basic concepts exposition. Related competencies: CG1, CG4, CE1.

Personalized assistance	
Methodologies	**Description**
Practices through ICT	Query and answer in the classroom and, if necessary, appointment for office work. Query and answer via e-mail. https://www.uvigo.gal/es/universidad/administracion-personal/pdi/fernando-martin-rodriguez
Mentored work	Query and answer in the classroom and, if necessary, appointment for office work. Query and answer via e-mail. https://www.uvigo.gal/es/universidad/administracion-personal/pdi/fernando-martin-rodriguez
Lecturing	Query and answer in the classroom and, if necessary, appointment for office work. https://www.uvigo.gal/es/universidad/administracion-personal/pdi/fernando-martin-rodriguez
Tests	**Description**
Report of practices, practicum and external practices	Answer to questions about laboratory reports. In assessment, a brief report with correct issues and found errors is sent. https://www.uvigo.gal/es/universidad/administracion-personal/pdi/fernando-martin-rodriguez
Report of practices, practicum and external practices	Answer to questions about laboratory reports. In assessment, a brief report with correct issues and found errors is sent. https://www.uvigo.gal/es/universidad/administracion-personal/pdi/fernando-martin-rodriguez

Assessment				
	Description	Qualification	Training and Learning Results	
Objective questions exam	These tests are based on theory classes concepts.	20	B1 B4	C1
Report of practices, practicum and external practices	THEME: related with the first theory units. Specifications are provided by lecturer. Students can choose to do this work individually or in pairs. The qualification of guided works comprises: achievements, documentation and bibliography selection. If work is done in pairs, qualification will be equal for both team members.	40	B1 B4	C1

Report of practices, practicum and external practices	INDIVIDUAL ORIGINAL JOB. THEME: negotiated with lecturer starting from student's suggestions. The qualification of guided works comprises: achievements, documentation and bibliography selection.	40	B1 B4	C1

Other comments on the Evaluation

There will be a final exam for those students that did not pass under the continuous assesment, the date will be scheduled by the school officials. Students are also allowed to go directly to the final exam skipping all continuous assessment activities (global assessment).This exam will be assessed between 0 and 10 and includes all concepts in theory classes and also the techniques being explained commonly for the guided works. To pass, students must achieve a minimum of 5 points.

Those students who did not pass in the ordinary call will be allowed to take an exam in the extraordinary one. The same rules as those for the exam in the first call will apply.
The "Objective questions exam" may be written or online. In any case, it will be held on the oficial exam date.

Sources of information

Basic Bibliography

Fernando Pereira and Touradj Ebrahimi, **The MPEG-4 book**, 1, MSC Press Multimedia Series, Pearson Education, 2002

Richardson, Iain E. G., **H.264 and MPEG-4 video compression: video coding for next generation multimedia**, 1, Wiley, cop., 2003

Complementary Bibliography

Thiagarajan, Jayaraman, **Analysis of the MPEG-1 Layer III (MP3) Algorithm using MATLAB**, 1, Morgan and Claypool, 2011

Recommendations

Subjects that are recommended to be taken simultaneously

Multimedia Communications/V05M145V01206

Subjects that it is recommended to have taken before

Signal Processing in Communications/V05M145V01102