IDENTIFYING DATA

Multimedia services

Subject	Multimedia services
Code	V05G300V01941
Study programme	Degree in Telecommunications Technologies Engineering

Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st

Teaching language	Spanish
Department	Telematics Engineering
Coordinator	Blanco Fernández, Yolanda
Lecturers	Blanco Fernández, Yolanda Ramos Merino, Mateo
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General description	The aim of this subject is to provide the students with the theoretical foundations and the practical skills that allow them to understand the basic principles of the digital treatment of the multimedia information. To this aim, the main standards in the field of the audiovisual content processing are presented, as well as the mechanisms available for the transmission of data through different types of networks and the different types of services that can be offered to the end user, with special attention to digital terrestrial TV broadcasting (DTTV) and transmission over IP networks (IPTV). The practical part of the subject will allow the students to experiment with the design and development of telematic services based on the transmission of multimedia streams, along with the programming of interactive services about digital television broadcasting and video-on-demand. The documentation of the subject will be available in English.

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
B6	CG6: The aptitude to manage mandatory specifications, procedures and laws.
C84	(CE84/OP27) The ability to apply the techniques based on computer, networks and distributed applications and services, in the broadcasting and interchange of audiovisual information.
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		
Understand the basic foundations of the digital treatment of the multimedia information.	B3	C84	
Know the main standards in the field of the processing of the multimedia information.	B6		
Understand the foundations and the main mediums adopted in digital TV broadcasting.	B6	C84	
Know the basic foundations of the transmission of audiovisual information through telematic networks.	B3	C84	D3
Acquire skills in the design and development of telematic services based on exchanging audiovisual contents.	B3	C84	D3
Acquire skills for the programming of telematic services in the scope of interactive digital television.		C84	

Contents

Topic	
1. Multimedia systems: Foundations and basic concepts	a. Digitalization of audio and video signals. b. Format for storage of audio and video signals. c. Conditional access and digital rights management.
2. Terrestrial Digital TV broadcasting	a. Architecture b. Transport of bitstreams c. Signaling d. Middlewares e. Mobile Digital Television
3. IP Television and video-on-demand	a. Architecture b. Data distribution. VoD and nVoD. c. Broadcasting, multicasting and P2P d. Systems and protocols e. Signaling

Planning

	Class hours	Hours outside the classroom	Total hours
Project based learning	7	36	43
Computer practices	6	19	25
Computer practices	6	23	29
Presentation	1	4	5
Lecturing	21	26	47
Objective questions exam	1	0	1

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

Methodologies

	Description
Project based learning	The students, organized in groups of 2-3 people (as per professor's criteria), will implement the project planned for group classes. The goal is to boost a collective discussion to identify the key points when it comes to developing the functionalities of each project. The students will combine face-to-face work in the computer room with the individual work. These methodologies will assess the skills CG3, CG6 and CT3.
Computer practices	The professor will propose practices in which the students will deal with the main concepts explained in the subject, putting the focus on the coding formats adopted in the transmission of multimedia information. The doubts arisen during the autonomous work of the students in the computer room will allow to promote the debate of the group to agree the best solution for each problem. These methodologies will assess the skills CE84 and CG3.
Computer practices	The professor will propose practices in which the students will deal with the main concepts explained in the subject, putting the focus on possible applications in the realm of Terrestrial Digital TV and transmission of television over IP. The doubts arisen during the autonomous work of the students in the computer room will allow to promote the debate of the group to agree the best solution for each problem. These methodologies will assess the skills CE84, CG3 and CG6.
Presentation	The students, organized into groups of 2-3 people (as per professor's criteria), will expose to their mates in the computer room the main design decision and implementation details of the Project planned for group classes, besides showing how it works. The aim is to argue the advantages and problems of each model, promoting the debate around the proposal of each group. These methodologies will assess the skills CG3, CG6 and CT3.
Lecturing	Classes where the main theoretical concepts of the subject will be explained, by proposing examples and possible application scenarios in the context of the transmission of multimedia streams. These methodologies will assess the skills CG3 and CG6.

Personalized attention

Methodologies	Description
Lecturing	The professor will address the doubts raised by each student during the public presentation of the contents that will be explained in master sessions.

Project based learning	In the computer room, the professor will carry out a personalized follow-up of the member of each group, with the goal of fixing possible deficiencies and guiding right decisions when facing design and implementation of the project.		
Computer practices	The personalized attention will be based on following-up the work of each student, by tracking the solutions proposed for each problem proposed in the practices in the computer room.		
Computer practices	The personalized attention will be based on following-up the work of each student, by tracking the solutions proposed for each problem proposed in the practices in the computer room.		
Presentation	The personalized attention will be based on following-up the work of each group, by tracking the solutions proposed for the system developed during type C-teaching.		

Assessment

	Description	Qualification	Training and Learning Results	
Project based learning	The students, organized in groups of 2-3 people (according to the criterion of the professor), will develop a project about Digital TV broadcast or video streaming over IP. This project must include the code and the necessary documentation to justify the main design decisions and implementation details. The mark of each member of the group (up to 2,5 points) will depend on the following criteria: (i) the quality of the documentation related to the part of the project this student has made, and (ii) the relevance and usefulness of the developed functionalities.	25	B3 B6	D3
Computer practices	The students, organized in groups of 2 people, will deliver a report in which they will describe the solution proposed for a first practice in the laboratory, which will be about the main formats of coding adopted in the transmission of the multimedia information over telematic networks. In case to be necessary, the submission will include the software used in the development of the solution proposed.	10	B3 C84	
Computer practices	The students, organized in groups of 2 people, will deliver a report that describes properly the solution proposed for the second of the practical proposals in the laboratory, which will be about Digital TV broadcast. The proposed solutions must include the coding adopted in the development of the practice, as well as a rigorous discussion about design decisions and implementation details.	20	B3 C84 B6	
Presentation	The students, organised in groups of 2-3 people (according to the criterion of the professor), will make a public presentation describing the main decisions of design and details of implementation of the project proposed for groups C. Each member of the group must identify which part of the project has developed, showing its real-time functioning during the public exhibition. The mark of each member (up to 1,5 points) will depend on the following criteria: (i) the particular level of knowledge about his/her contribution, (ii) its complexity, and (iii) his/her personal performance during the exhibition.	15	B3 B6	D3
Objective questions exam	Each student will take --individually and without material of support-- an exam including multiple-choice tests and short-answer questions, which is aimed at assessing his level of understanding on the theoretical concepts explained in the subject. This exam will be held on the official date approved by the Board of School. Any type of support material is not allowed in this exam.	30	B3 B6	

Other comments on the Evaluation

Lessons will be explained in Spanish, although the material about the subject will be available in English.

There exist two mechanisms for the assessment of students in this subject: continuous assessment (CA) and eventual assessment (EA). Regardless of the considered assessment mechanism, the pass mark for the subject is 5 out of 10.

The students must choose one of the possible mechanisms by bearing in mind the following conditions:

- CA includes the 5 tests described above.
- By the submission of the first lab practice, the student makes a commitment to be assessed via CA, thus renouncing the EA mechanism. In virtue of this commitment, the final remark of these students cannot be "Not taken".
- Students who do not submit the first practice renounce to the CA, thus being assessed through the EA mechanism. Note that it will not be possible to join the CA in the next tests.
- The schedule of the midterm/intermediate exams will be approved in the Comisión Académica de Grado (CAG) and

will be available at the beginning of each academic semester.

- CA tests will be carried out only in the dates defined by the professors. These CA tests cannot be repeated later.
- The grades obtained in the CA and other exams and practical projects are only valid for the current academic year.
- CA will be just considered in the first call to pass the subject. In the second one and in the extraordinary call only EA will be valid.
- Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

Students who sit CA in the first call will be assessed as follows:

- CA tests will be 100% of the final remark of the student. This assessment mechanism consists of five CA tests that have been previously described (a multiple-choice test, two practices in the computer room, delivery of code and documentation of the practical project proposed for group classes, and the public presentation of its main design and implementation decisions, including a real-time demo of its functioning). Note that the student makes a commitment to follow-up CA by submitting the first practice during the 6th week of the course, thus renouncing the EA mechanism.

Students who sit EA in the first call will be assessed as follows:

- A final exam that these students will take in the official date published at http://www.teleco.uvigo.es. This test will include short-answer questions and/or multiple-choice tests, along with problems and practical use cases to be analyzed and resolved. The weight of this exam in the final remark is 50%. Note that support materials are not allowed.
- Submission of a practical project that will include software and documentation to justify design decisions and describe implementation details. The weight of this project in the final remark is 50%. Note that that each student must submit this project individually in week 17.

Students who did not pass the subject in the first call, will have **a second call** where they cannot be assessed via CA, so that **only EA is valid**. Therefore, these students must (i) take the final exam (in the official date published at http://www.teleco.uvigo.es) and (ii) submit individually the practical project (in the date published by professors at www.faitic.uvigo.es), as described above for the EA mechanism. The weight of each part in the final remark will be 50%. The same assessment mechanism is valid for the **extraordinary call**.

Sources of information
Basic Bibliography
Wes Simpson, **Video over IP IPTV, Internet video, H.264, P2P, Web TV, and streaming: a complete guide to understanding the technology**, Elsevier, 2008
Frantisek Korbel, **FFmpeg Basics: Multimedia handling with a fast audio and video encoder**, CreateSpace, 2012
Complementary Bibliography
Jan Lee Ozer, **Video Encoding by the Numbers: Eliminate the Guesswork from your Streaming Video**, Doceo Publishing, 2016
José J. Pazos Arias, Carlos Delgado Kloos, Martín López Nores, **Personalization of Interactive Multimedia Services: a research and development perspective**, Nova Science Publishers, 2008
George Lekakos, Konstantinos Chorianopoulos, Georgios Doukidis, **Interactive Digital Television: technologies and applications**, IGI Publishing, 2007
Liliana Ardissono, Alfred Kobsa, Mark Maybury, **Personalized Digital Television: targeting programs to individual viewers**, Kluwer Academic Publishers, 2004
Digital Video Broadcasting Consortium, **DVB Standards**,

Recommendations

Other comments

It is recommended to have taken or to be taking the following subjects of the Telematics-related module:

+ Operating systems
+ Architecture and Technology of Networks
+ Security
+ Concurrent and Distributed Programming
+ Networks and Switching Theory
+ Multimedia Networks
+ Systems of Information
+ Architectures and Telematic Services