



## IDENTIFYING DATA

### Multimedia Networks

Subject	Multimedia Networks			
Code	V05G300V01643			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department	Telematics Engineering			
Coordinator	López García, Cándido Antonio			
Lecturers	Herrería Alonso, Sergio López García, Cándido Antonio			
E-mail	candido@det.uvigo.es			
Web	<a href="http://fatic.uvigo.es">http://fatic.uvigo.es</a>			
General description	This subject presents the main specific technological solutions for distributing multimedia contents over telecommunication networks.			

## 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.			
C30	CE30/TEL4 The ability to describe, program, assess and optimize communication protocols and interfaces at different network architecture layers .			
C33	CE33/TEL7 The ability to program network and distributed applications and services.			
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		
(*)CE-14 Comprender el concepto de responsabilidad social corporativa, ser capaz de elaborar una memoria de sostenibilidad conforme a las normas establecidas y utilizarla como medio de comunicación con los grupos de interés de la organización.			
The comprehension of basic concepts in digital encoding of audio and video.	B3		
The knowledge of the main standards in the field of digital encoding of audio and video.	B6		
The knowledge and comprehension of the main problems raised in the transmission of multimedia contents.	B3	C30	D3
The knowledge of the main protocols used for the transmission of multimedia contents.		C30	
The knowledge and comprehension of the main techniques used to provide quality of service in Internet.	B3	C30	D3
The ability to analyze and develop VoIP networks.		C30	C33

## Contents

Topic			
Encoding of digital audio and video	a) Digital audio (PCM). Audio compression	b) Digital video. Intraframe and interframe compression	

Multimedia applications	a) Classes. Quality of service (QoS) requirements b) Impact of delay and packet losses c) Content distribution. Multicast. CDN d) IP telephony: architecture, codecs, softphones, softswitches...
Multimedia protocols	a) Transport protocols: TCP/UDP, RTP, HTTP b) Adaptive streaming. MPEG-DASH c) Session protocols: SIP, H.323, RTSP
Quality of service in the Internet	a) Monitoring and policing techniques b) Scheduling and resource allocation c) Differentiated Services (DiffServ) d) Integrated Services (IntServ). RSVP

## Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	40	60
Computer practices	12	18	30
Supervised work	6	24	30
Problem solving	1	5	6
Essay	1	5	6
Problem solving	2	16	18

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

## Methodologies

	Description
Lecturing	Exhibition of the ideas, concepts and techniques of each topic of the course. In these sessions, students must acquire competences CG3, CG6, CE30 and CT3.
Computer practices	Practical learning of basic tools for the distribution of multimedia contents on computer networks. Group activity. In these sessions, students must acquire competences CE30 and CE33.
Supervised work	Configuration, with the teacher's guidance, of a basic IP PBX. Group activity. This work should help students to acquire competence CE33.

## Personalized attention

Methodologies	Description
Lecturing	It will be dispensed personalized attention during the office hours that will be announced at the beginning of the course. There is no appointment necessary.
Computer practices	It will be dispensed personalized attention during the office hours that will be announced at the beginning of the course. There is no appointment necessary.
Supervised work	It will be dispensed personalized attention during the office hours that will be announced at the beginning of the course. There is no appointment necessary.

## Assessment

	Description	Qualification	Training and Learning Results
Problem solving	Midterm exam covering some of the contents of the subject. Questions and problems of conceptual, logical, analytical or applied character. One hour long written exercise.	20	B3 C30 B6
Essay	Evaluation of the features and performance of the IP PBX configured by the student during the course.	20	C33
Problem solving	Final exam covering all the contents of the subject. Questions and problems of conceptual, logical, analytical or applied character. Two hour long written exercise.	60	B3 C30 B6

## Other comments on the Evaluation

Two different methods of evaluation will be offered to the students: continuous assessment and eventual assessment.

Students opting for the continuous assessment must take two intermediate tasks: a midterm exam (20% of the final grade) and a project involving the configuration of a basic IP PBX (20% of the final grade), together with a final exam at the end of the course (60% of the final grade). If the score of the final exam is less than 3.5/10, then the final grade of the subject will be the score obtained in this final exam. The score of the project will take into account both the features and performance of the IP PBX configured (75%) and the answers to a practical exam that must be solved individually (25%). Both intermediate

tasks are not recoverable and will be only valid for the current course.

Students can also opt for being evaluated by means of just a final exam at the end of the course. The final grade of the subject will be, in this case, just the score obtained in this exam.

It will be considered that a student opts for the continuous assessment if he takes the midterm exam or the project proposed. The final exam will contain some additional questions for those students that have opted by the eventual assessment.

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.

Those students that have not passed the subject in first call will have to take an extra written exam in July. Those students that opted for the continuous assessment will be able to choose between evaluation by means of just the final exam or to keep continuous assessment. In the latter case they would keep the scores obtained in the intermediate tasks (midterm exam and project) and would only have to take the final exam as the last task. Students must indicate which method they choose at the final exam.

In extraordinary calls the assessment will just consist in the realisation of a written exam including ALL the contents of the subject.

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.

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### Sources of information

#### Basic Bibliography

J. F. Kurose, K. W. Ross, **Computer networking: a top-down approach**, 7ª ed., Pearson, 2016

Kun I. Park, **QoS in packet networks**, 1ª ed., Springer, 2005

R. Bryant, L. Madsen, J. Van Meggelen, **Asterisk: the definitive guide**, 4ª ed., O'Reilly Media, 2013

#### Complementary Bibliography

H. W. Barz, G. A. Bassett, **Multimedia networks: protocols, design, and applications**, 1ª ed., Wiley, 2016

M. Barreiros, P. Lundqvist, **QoS-enabled networks: tools and foundations**, 2ª ed., Wiley, 2016

Bruce Hartpence, **Packet Guide to Voice over IP**, 1ª ed., O'Reilly Media, 2013

S. Wintermeyer, S. Bosch, **Practical Asterisk 1.4 and 1.6**, 1ª ed., Addison-Wesley, 2010

Alan B. Johnston, **SIP: Understanding the Session Initiation Protocol**, 4ª ed., Artech House Publishers, 2015

Z. Li, M. Drew, J. Liu, **Fundamentals of Multimedia**, 2ª ed., Springer, 2014

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### Recommendations

#### Subjects that continue the syllabus

Multimedia services/V05G300V01941

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#### Subjects that it is recommended to have taken before

Fundamentals of Sound and Image/V05G300V01405

Computer Networks/V05G300V01403