



## IDENTIFYING DATA

### Multimedia Networks

Subject	Multimedia Networks			
Code	V05G301V01308			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Herrería Alonso, Sergio			
Lecturers	Herrería Alonso, Sergio López García, Cándido Antonio			
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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		
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	
Digital Audio and Video Encoding	a) Digital audio (PCM). Audio compression b) Digital video. Intraframe and interframe compression
Multimedia Applications	a) Classes. Quality of service 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
Practices through ICT	12	18	30
Mentored work	5	25	30
Problem and/or exercise solving	1	5	6
Project	2	4	6
Problem and/or exercise 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 and CE30.
Practices through ICT	Practical learning of basic tools for the distribution of multimedia contents on computer networks. Group activity. In these sessions, students must acquire competences CE30, CE33 and CT3.
Mentored work	Configuration, with the teacher's guidance, of a basic IP PBX. Group activity. This work should help students to acquire competences CE33 and CT3.

## Personalized assistance

Methodologies	Description
Lecturing	Personalized assistance will be provided in person and/or remotely by email, Fatic forums or Campus Remoto during the office hours that will be announced at the beginning of the course.
Practices through ICT	Personalized assistance will be provided in person and/or remotely by email, Fatic forums or Campus Remoto during the office hours that will be announced at the beginning of the course.
Mentored work	Personalized assistance will be provided in person and/or remotely by email, Fatic forums or Campus Remoto during the office hours that will be announced at the beginning of the course.

## Assessment

	Description	Qualification	Training and Learning Results
Problem and/or exercise 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
Project	Evaluation of the features and performance of the IP PBX configured by the student during the course.	20	C33
Problem and/or exercise 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 exam-only assessment.

Students opting for 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 (70%) and the answers to a practical exam that will be solved individually (30%). 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. In this case, the final grade of the subject will be the score obtained in this exam.

It will be considered that students opt for the continuous assessment if they take the midterm exam or the project proposed. Students taking the final exam will be considered presented to the subject. The final exam will contain some additional questions for those students that have opted by the exam-only assessment.

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the exams or project, 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 a new written exam in second call. Those students that opted for continuous assessment in first call will be able to choose in second call between exam-only assessment or to keep continuous assessment. In the latter case, they will keep the scores obtained in the intermediate tasks (midterm exam and project) and will only have to take the final exam as the last task. Students must indicate their preferred assessment method at the final exam.

In the end-of-program call the assessment will just consist in the realization of a written exam about 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

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

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

R. Bryant, L. Madsen, J. Van Meggelen, **Asterisk: the definitive guide**, 5ª ed., O'Reilly Media, 2019

#### 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

Flavio Goncalves, **Complete Asterisk Training**, 1ª ed., 2019

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

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

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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/V05G301V01209

Computer Networks/V05G301V01210

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### Contingency plan

#### Description

In case of online tuition, the planning proposed will be maintained with just some small adjustments. Lecturing will continue through Campus Remoto in the schedule established whereas the practices with ICT support will be properly adapted so that they can be made by the students in their personal computers instead of in the laboratory.

Regarding the assessment, the same intermediate tasks (midterm exam, project and final exam) with the same weighting will be carried out. Only the evaluation of the project will be modified. In this scenario, the project will be individually evaluated by means of a series of optional assignments proposed along the course and of a questionnaire at the end of the course. The students will be able to sum up to 1,5 points to the score obtained in the questionnaire (on 10 points) if they satisfactorily complete all the optional assignments proposed. Anyway, the maximum score in the project will be 10 points.