

**1. General information****Course:** AUDIOVISUAL SYSTEMS**Type:** CORE COURSE**Degree:** 385 - DEGREE IN TELECOMMUNICATIONS TECHNOLOGY ENGINEERING**Center:** 308 - SCHOOL POLYTECHNIC OF CUENCA**Year:** 4**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 59662**ECTS credits:** 6**Academic year:** 2021-22**Group(s):** 30**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N

Lecturer: <b>JUAN JOSE DE DIOS DE DIOS</b> - Group(s): <b>30</b>				
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**2. Pre-Requisites**

Have successfully completed the courses "Analysis of Systems", "Transmission media", "Communications", "Processing of the audiovisual signal", "Antennas and radio communications", "Processing and transmission" and "Audio and Video Equipment and Studios". In particular, it is necessary to master the contents related to analog-digital conversion, fundamentals of audio and video compression, analog and digital modulations, communication channels, transmission media and Matlab.

**3. Justification in the curriculum, relation to other subjects and to the profession**

Audiovisual technology is one of the professional branches of telecommunication engineering. This course is based on the contents developed in previous courses included in the audiovisual and communications subjects.

**4. Degree competences achieved in this course****Course competences**

Code	Description
E21	The ability to build, use and manage telecommunications services and applications, defined as capture, analogue and digital processing, coding, transport, representation, processing, storage, reproduction, management and presentation of audiovisual services and information multimedia systems.
E22	The ability to analyse, specify, perform and maintain systems, equipment, headers and television, audio and video installations, in both fixed and mobile environments.
E23	The ability to carry out projects in premises and installations for the production and recording of audio and video signals.
E25	The ability to create, codify, manage, disseminate and distribute multimedia contents, according to usability criteria and accessibility of audiovisual, broadcast and interactive services.
G02	Correct, oral and written, communication skills.
G03	Ethical commitment and professional ethics.
G04	Ability to write, develop and sign projects in the field of the specific technologies of Sound & Image and/or telecommunication systems of Technical Telecommunications Engineering profession whose purpose, according to the knowledge acquired according to section 5 of ministerial order CIN/352/2009 of 9 February, the creation and the development or operation of telecommunication and electronic networks, services and applications.
G05	Knowledge, understanding and ability to apply the necessary legislation during the development of the profession of Technical Telecommunications Engineer and being able to easily deal with specifications, regulations and mandatory regulations
G06	Knowledge of basic subjects and technologies, enabling students to learn new methods and technologies, as well as providing great versatility to adapt to new situations
G07	The ability to tackle problems with initiative, making decisions, creativity, and to communicate and transmit knowledge, skills and abilities, including the ethical and professional responsibility of the activity of a Technical Telecommunications Engineer
G08	Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, task planning and other similar work in their specific telecommunications field
G09	Being able to easily handle specifications, regulations and mandatory regulations
G10	The ability to analyse and assess the social and environmental impact of technical solutions
G11	Knowing and applying basic elements of economics and human resources management, organisation and planning of projects, as well as legislation, regulation and standardisation in telecommunications
G12	The ability to work in a multidisciplinary group and in a multilingual environment and to communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics
G13	The ability to look for and understand information, whether technical or commercial in different sources, to relate and structure it to integrate ideas and knowledge. Analysis, synthesis and implementation of ideas and knowledge.

**5. Objectives or Learning Outcomes****Course learning outcomes**

## Description

Understanding of the basic structure of the television signal.

Comparison of the different coding techniques applied to the different digital television standards depending on the transmission medium.

Comparison of the different video compression techniques according to their basic parameters.

Connection and management of the equipment and elements involved in a television studio: lighting elements, cameras, control and measurement equipment, processing equipment and recorders.

Configuration and management of streaming systems.

Application of current regulations to the design of digital television reception systems.

Application of basic network topologies to digital television distribution systems.

Analysis, synthesis and compression of technical documentation and mastery of specific vocabulary.

Understanding of the mechanisms associated with the digital audio and video signals transmission.

Identification of the fundamental elements for the digital television signal transmission in both fixed and mobile environments.

Knowledge and design of the basic structure for a TV, audio and video header.

Recognition of the basic elements belonging to the different digital television broadcasting systems in both fixed and mobile environments.

Selection of the necessary equipment to build a full digital television reception system.

Making of recordings and measurements to characterize the operation of a device or a configuration using the mixer, transducers, players, processors and audio recorders.

Realization of control and quality measures of the analog and digital signals in television and sound studios.

Correct use of oral and written expression to convey ideas, technologies, results, etc.

## 6. Units / Contents

### Unit 1: Basic TV system

**Unit 1.1** Fundamentals of light and colour

**Unit 1.2** Theory and colour coding

**Unit 1.3** Image exploration and synchronization

**Unit 1.4** Audio and Video Transmission

**Unit 1.5** TV channels

**Unit 1.6** PAL System

### Unit 2: Digital TV standards

**Unit 2.1** Introduction to digital TV

**Unit 2.2** Evolution towards HDTV

**Unit 2.3** Digital vs. analog TV

**Unit 2.4** Need for compression on TV

**Unit 2.5** Conversion and coding of the video signal

**Unit 2.6** Digital TV Standards

**Unit 2.7** Characteristics of DVB systems

**Unit 2.8** Implementation of TDT

**Unit 2.9** ITU-R 601 standard

**Unit 2.10** ITU-R 656 standard

### Unit 3: MPEG Compression

**Unit 3.1** MPEG standards

**Unit 3.2** Video compression: spatial and temporal

**Unit 3.3** Audio compression

**Unit 3.4** MPEG-4 Compression

**Unit 3.5** Advanced video compression

### Unit 4: Multiplexing

**Unit 4.1** TV broadcasting

**Unit 4.2** Elementary data structures: ES and PES

**Unit 4.3** System layer functions

**Unit 4.4** Other transport structures: Program and Transport Streams

**Unit 4.5** System Tables

**Unit 4.6** DVB-SI Tables

**Unit 4.7** TV program "Tuning"

### Unit 5: Distribution, transmission and reception of TV systems

**Unit 5.1** TV distribution header

**Unit 5.2** Digital satellite TV (DVB-S)

**Unit 5.3** Digital cable TV (DVB-C)

**Unit 5.4** Digital terrestrial TV (DVB-T)

**Unit 5.5** Digital TV on mobile devices (DVB-H)

### Unit 6: New multimedia technologies

**Unit 6.1** Streaming, IPTV, Online TV

**Unit 6.2** Other technologies

### Unit 7: Laboratory

**Unit 7.1** Quality of TV signal

**Unit 7.2** Reception of TDT channels

**Unit 7.3** ITU Standards 601/709

**Unit 7.4** Transmission of the DTV signal. Images P and B.

**Unit 7.5** Transmission and distribution of DTV

**Unit 7.6** DVB-C, DVB-S and DVB-T systems

**Unit 7.7** Reception of satellite TV

## ADDITIONAL COMMENTS, REMARKS

Available resources:

- SOFTWARE: Matlab, Simulink, FilmoraPro, etc

- HARDWARE: Measuring and test equipment in lab. 1.21 and 1.24.

7. Activities, Units/Modules and Methodology							
Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E21 E22 E23 E25 G02 G04 G05 G06 G08 G09 G10 G11	1.38	34.5	N		- Theoretical lessons
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	E21 E22 E23 E25 G02 G04 G05 G06 G07 G08 G09 G11 G12	0.18	4.5	N		- Problems solved during the lessons
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	E21 E22 E23 E25 G02 G03 G04 G05 G06 G07 G08 G09 G11 G12 G13	0.62	15.5	N		- Introduction to lab sessions
Practicum and practical activities report writing or preparation [OFF-SITE]	Practical or hands-on activities	E21 E22 E23 E25 G02 G03 G04 G05 G06 G07 G08 G09 G11 G12 G13	0.56	14	Y	Y	Assessment of individual (or team) laboratory reports, which must be submitted in pdf format, including the collected results and the conclusions obtained during the lab sessions. If necessary, the resulting files must be added. Only delivered using Campus Virtual. Failed practical activities can be retaken by delivering again the laboratory reports in the resit/retake exam. If copy or plagiarism is detected, the grade will be 0 for all of the involved students.
Writing of reports or projects [OFF-SITE]	Collaborative on line international learning (COIL)	E21 E22 E23 E25 G02 G03 G04 G05 G06 G07 G08 G09 G11 G12 G13	0.65	16.25	Y	N	A theoretical or practical work related to the subject must be prepared and presented in class during the last academic week of the semester. In addition to making the presentation, a copy in pdf format of the slides must be delivered. It can be retaken in an extra session after the retaken test session. If copy or plagiarism is detected, the grade will be 0 points for all the involved students (art. 9 REE).
Individual tutoring sessions [ON-SITE]	Collaborative on line international learning (COIL)	E21 E22 E23 E25 G02 G03 G04 G05 G06 G07 G08 G09 G11 G12 G13	0.07	1.75	N		- Individual tutoring sessions
Final test [ON-SITE]	Assessment tests	E21 E22 E23 E25 G02 G03 G04 G05 G06 G07 G08 G09 G11 G12 G13	0.15	3.75	Y	Y	Final written test of theory and problem solving. Final test can be retaken.
Study and Exam Preparation [OFF-SITE]	Self-study	E21 E22 E23 E25 G02 G03 G04 G05 G06 G07 G08 G09 G11 G12 G13	2.39	59.75	N		- Student's self-study
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System			
Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Final test	50.00%	50.00%	A final written test of theory and problem solving will be assessed.
Practicum and practical activities reports assessment	40.00%	40.00%	Practical tests and/or written reports to assess hands-on activities. Oral presentation maybe requested.
Projects	10.00%	10.00%	Project will be done individually or in groups. Oral presentation will be requested.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

**Evaluation criteria for the final exam:****Continuous assessment:**

Marks greater than 4 in the final test and laboratory sessions will be required; otherwise the course will be considered as failed. Evaluation criteria are described in the "Evaluation System" table.

**Non-continuous evaluation:**

The student who justifiably cannot attend the activities regularly must notify the teacher at the beginning of the semester. Marks greater than 4 in the final test and laboratory sessions will be required; otherwise the course will be considered as failed. Evaluation criteria are described in the "Evaluation System" table.

**Specifications for the resit/retake exam:**

Final test could be retaken. The evaluation criteria will be as described in the "Evaluation System" table, if the grade of both, the final test and the laboratory activities, is greater than 4 points.

**Specifications for the second resit / retake exam:**

The evaluation criteria will be as stated in "Grading System" table. If the student passed the laboratory sessions in advance, final test could be retaken. If not, it will be assessed through a theory-practice test.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Writing of reports or projects [AUTÓNOMA][Collaborative on line international learning (COIL)]	16.25
Individual tutoring sessions [PRESENCIAL][Collaborative on line international learning (COIL)]	1.75
Final test [PRESENCIAL][Assessment tests]	3.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	59.75
Unit 1 (de 7): Basic TV system	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	9
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2.5
Unit 2 (de 7): Digital TV standards	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Unit 3 (de 7): MPEG Compression	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Unit 4 (de 7): Multiplexing	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Unit 5 (de 7): Distribution, transmission and reception of TV systems	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	5.5
Unit 6 (de 7): New multimedia technologies	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Unit 7 (de 7): Laboratory	
Activities	Hours
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	14
Global activity	
Activities	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4.5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15.5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Practical or hands-on activities]	14
Writing of reports or projects [AUTÓNOMA][Collaborative on line international learning (COIL)]	16.25
Individual tutoring sessions [PRESENCIAL][Collaborative on line international learning (COIL)]	1.75
Class Attendance (theory) [PRESENCIAL][Lectures]	34.5
Final test [PRESENCIAL][Assessment tests]	3.75
Study and Exam Preparation [AUTÓNOMA][Self-study]	59.75
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Benoit, Hervé	Televisión digital	Paraninfo		84-283-2483-2	1998	
Bethencourt Machado, Tomás	Sistemas de televisión clásicos y avanzados	Centro de Formación Radiotelevisión Española		84-86984-54-8	1991	
Bethencourt Machado, Tomás	Televisión digital	Temas audiovisuales		84-607-3527-3	2001	
	Digital video and audio					

Fischer, Walter	broadcasting technology : a practical engineering guide	Springer	978-3-642-26175-6	2009	
Lundström, Lars-Ingemar	Understanding digital television: an introduction to DVB sys	Focal Press	978-0-240-80906-9	2006	
Benoit, Hervé	Digital television : MPEG-1, MPEG-2 and principles of the D	Focal Press	0-240-51695-8	2002	
Martín Marcos, Alfonso L.	Televisión digital	Ciencia 3 Universidad	84-95391-12-0 (v.1)	2006	
Mossi García, José Manuel	Sistemas de televisión	Politécnica de Valencia	84-7721-711-4	1998	
Reimers, U.	DVB : the family of International Standards for Digital Vide	Springer	3-540-43545-X	2004	
					TDT
	<a href="http://www.televisiondigital.es">www.televisiondigital.es</a>				
	<a href="http://www.etsi.org">www.etsi.org</a>				ETSI
	<a href="http://www.dvb.org">www.dvb.org</a>				DVB