COURSE DATA

DATA SUBJECT

Code: 34809
Name: Multimedia electronic systems
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	Escola Tècnica Superior d'Enginyeria	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	Applications of electronic systems	COMPULSORY

COORDINATION

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SUMMARY

'Multimedia Electronic Systems' is part of the subject 'Applications of Electronic Systems'. It is a quarterly and obligatory matter, taught in the 2nd quarter of the third year of the Degree in Electronic Engineering in Telecommunications. It comprises a total of 6 ECTS.

This course is intended for students to delve into the domain of devices that enables multimedia. To do this, and taking as a starting point to study the characteristics of visual and auditory perceptual systems humans, establish the characteristics, components, techniques and peculiarities of the systems acquisition and reproduction of audio data, image and digital video, emphasizing noise considerations and signal quality. Also describe techniques and digital processing algorithms commonly used in the scope of audio and image.

The subject has a mixed theoretical and practical, so that over the theoretical contents are added a practical level. As problems resolution as the realization of practical laboratory work, exercise the concepts and techniques studied familiarizing the student with the scope.

This course complements the course Digital Signal Processing, studied in the first quarter of the third year of the degree of grade, providing a real vision systems that perform digital processing within the scope of

multimedia.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

No previous knowledge is required, but is recommended that students have taken the course of Digital Signal Processing, which is taught in the first semester of the third year of the degree.

COMPETENCES / LEARNING OUTCOMES

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G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.

G5 - Knowledge to carry out measurements, calculations, assessments, evaluations, loss adjustments, studies, reports, task planning, and other analogous work in the specific field of telecommunications.

G7 - Ability to analyze and assess the social and environmental impact of technical solutions.

TE1 - Ability to construct, operate and manage systems for the acquisition, transport, representation, processing, storage, management and presentation of multimedia information, from the perspective of electronic systems.

TE2 - Ability to select specialized electronic circuits and devices for transmitting, routing and the terminals, both in fixed and mobile environments.

TE4 - Ability to apply electronics as support technology in other fields and activities, not only in the field of Information Technology and Communications.

TE7 - Ability to design interface, data acquisition and storage devices, and terminals for telecommunication services and systems.

DESCRIPTION OF CONTENTS

Historical evolution. Media classification. Digital media integration. Multimedia system definition.

1. Basical multimedia foundations.

Historical evolution. Media classification. Digital media integration. Multimedia system definition. Global estructure. Devices domain.

2. Devices domain

Processing conversion estructure. Sampling and aliasing. Sampling Theorem. Quantization. Frequency sampling selection.

3. Hearing perception.

Physics of sound. Psychoacustics. The human hearing. Intensity perception. Rang of frequencies. Atributes of sound. Sensibility to the phase. Location. Psicoacustical keys of spatial location of sounds.

4. Recording process.

Coding systems. Dither generation. Antialiasing filtering. Sample and hold circuits. Jitter. A/D conversion. Channel coding.

5. Reprodution process.

Signal reproduction. D/A conversion. Distorsion by lineaty errors.

6. Oversampling.

Oversampling. Delta modulation. Sigma-Delta modulation.

7. Digital Audio Effects.

Digital delay. Echo and digital reverberation. Enhancements. Chorus. Ping-pong. Equalization. Aurealization.

8. Image perception.

Human eye. Response to the ilumination and discrimination. Color perception. Coordinate color systems.

9. Image acquisition foundations.

Bidimensional sampling. Spatial and temporal aliasing. Estructure and characteristics of an image digitizer. Light sensor. Modulator transference function: MTF

10. Acquisition devices.

Video signal digitizing. Solid state cameras: fotodiodes array, charge coupling devices (CCD) and charge injection devices (CID). Bayer masks. Other sensors.

11. Digital image processing.

Basical concepts. Enhancements techniques. Digital filters. Edge detection. The bidimensional transfer function. Pseudocolor.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	20,00
Preparation of lessons	60,00
Preparation for assessment activities	10,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

This course is structured around theory and problems classes, labs and office hours.

The **lectures** (outcomes TE1, TE7, G3, G4 y G9) will use in general the usual theoretical class model , although it can be used the flipped learning model in some sessions.:

- Flipped learning: The students will have, prior to the class, a video recording with the explanation of the contents of the session and a bulletin of questions to answer after viewing the video. Thus, the session will focus on clarifying the doubts that have arisen while viewing the video or during the resolution of the questions's bulletin. Later, the teacher will propose activities related with the contents of the session.

- Theoretical classes. In general, it will be used this model, where the teacher will teach the class by presenting and explaining the contents of each issue, focusing on key aspects for understanding it. It may be used different kinds of media (presentations,transparencies, blackboard, ...).

The **class of problems** (outcomes TE1, TE4, TE7, G4 and G9) emphasize on problema solving.

For **laboratory practice** sessions (outcomes T1, TE4, TE7 and G4), students will have scripts to conducte the session, under the supervision of the teacher. At the beginning of each practice will be done an introduction and explanation of the most complex issues. Its estimated time is 3 hours, and practice groups will consist of no more than two persons.

In addition, students will have a schedule of **office hours** aimed at solving the problems and doubts about the matter. The schedule of these office hours will be indicated at the beginning of the academic year and will be as broad as possible so that students can attend it. However, they also have the opportunity to clarify some doubts via email.

EVALUATION

The learning evaluation will take place from the evaluation of a single theoretical exam (EXT), that will be carried out on the official date, plus the results obtained in the exam and/or the laboratory sessions (LAB).

Laboratory grade (LAB) will contribute to the final grade with a weight of 30%. The theory part (EXT) will contribute to the final grade with a weight of 70%.

Total mark = 0.3 * Practice mark (LAB) + 0.7 * Theory mark (EXT)

In the second call, there will be a practical exam for those students who did not pass it in the first call. The average score fwill only be calculated if both parts exceed a grade of 5.

Eventually, partial exams may be held during the course. Any partial exam will be considered approved when it exceeds the grade of 5. Passing a partial exam implies eliminating the corresponding matter in the first official examination. However, even with reduced matter, the official exam must be passed with a grade of 5 or higher.

EXT evaluates the outcomes TE1, TE4, TE7, G3, G4 and G9. LAB evaluates the outcomes TE1, TE4, and G4.

In any case, the evaluation system will be subordinate for the Evaluatino an Qualification Regulation of the University of València for Degrees and Masters (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado= 5639).

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

Basic bibliography:

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Complementary bibliography:

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