



IDENTIFYING DATA

Fundamentals of Sound and Image

Subject	Fundamentals of Sound and Image			
Code	V05G300V01405			
Study programme	(*)Grao en Enxeñaría de Tecnoloxías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish			
Department				
Coordinator	Martín Rodríguez, Fernando			
Lecturers	Docio Fernández, Laura Márquez Flórez, Óscar Willian Martín Rodríguez, Fernando Pena Giménez, Antonio			
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General description	"Fundamentos de Sonido e Imagen" presents the basic concepts of sound and image, as well as the processes operating over the audiovisual signals.			

Competencies

Code	
B3	CG3: The knowledge of basic subjects and technologies that capacitates the student to learn new methods and technologies, as well as to give him great versatility to confront and update to new situations
B5	CG5: The knowledge to perform measurements, calculations, assessments, appraisals, technical evaluations, studies, reports, task scheduling and similar work to each specific telecommunication area.
C13	CE13/T8: The ability to understand the electromagnetic and acoustic wave mechanisms of propagation and transmission, and their corresponding receiving and transmitting devices.
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	
Analysing the basic properties of the sound.	C13	D3
Explaining different sound production systems: human sound production, musical instruments, machines and other vibrant systems.	C13	D3
Interpreting results of acoustic measures and selecting tools for the appropriate analysis.	B5	D3
Describing the human perception of sound based on the physiological interface and the psychology of the perception.	C13	D3
Reviewing different processes and systems associated to the sound production	B3 B5	D3
Applying the basic rules of the colorimetry.	B3	D3
Analysing lens systems.	B3 B5	D3
Choosing the most suitable capture and presentation image systems.	B3 B5	D3
Choosing the most adapted formats for image and video.	B3 B5	D3
Relating the influence of the coding parameters with the results of compression and quality.	B3 B5	D3

Contents	
Topic	
S1. Acoustic waves	Introduction. Acoustic wave equation. Harmonic plane waves. Spherical waves. Power and Intensity. Diffraction
S2. Sound propagation and transmission	Acoustic field. Propagation. Transmission between different media.
S3. Sound radiation and production	Impedances. Transducers. Mechanical vibration. Radiation of simple sources. Directivity.
S4. Sound perception	Human audition. Auditory losses. Equal loudness contours.
I1. Colorimetry	Fixed image signals and video signals. Visual human system. Light and colour. Visual effects.
I2. Capture and representation of images	Cameras and lens. Monitors. 3D Visualisation.
I3. Image and video coding	Fixed image: format of colour YUV; standards of compression. Image in movement: H.261 standard; MPEG formats.
Projects S1 and S2. Sound analysis.	Time, frequency and spectrograms.
Projects S3 and S4. Sound measurements	Sound pressure level. Sonometer. Octave-filter banks
Project I1. Colorimetry	Basic functions
Project I2. Fixed images coding	Functions for JPEG coding
Project I 3. Video coding	Time-predictive coding

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Master Session	25	50	75
Troubleshooting and / or exercises	6	12	18
Practice in computer rooms	19	19	38
Forum Index	0	1	1
Multiple choice tests	0	2	2
Long answer tests and development	4	0	4
Short answer tests	1	0	1
Reports / memories of practice	0	10	10

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

Methodologies	
	Description
Introductory activities	Course presentation: programme, reading materials, teaching methodology and assessment system.
Master Session	<p>Developed capabilities: CG3, CG5, CE13, CT3.</p> <p>Instructor presentation of the main concepts of each subject. Classes do not cover all content that is examination material. The student should take the contents of the documents provided for each subject.</p> <p>Student will work alone afterwards on the concepts studied in class and on expanding this content using the documents provided for each subject. Identification of doubts that need to be resolved in personalized tutorials.</p>
Troubleshooting and / or exercises	<p>Developed capabilities: CG3, CG5, CE13, CT3.</p> <p>Problems and exercises formulated according to the content of the lectures and the documents for each subject. Students solve problems and exercises prior to the class. Identification of doubts that need to be resolved in personalized tutorials.</p>
Practice in computer rooms	<p>Developed capabilities: CG3, CG5, CE13, CT3.</p> <p>Handling of analysis tools and algorithms. Identifying which one must to be used to solve each specific problem.</p> <p>Identification of doubts that need to be resolved in personalized tutorials.</p>
Forum Index	<p>Developed capabilities: CG3, CG5, CE13, CT3.</p> <p>The website for the course is included in the TEMA platform (http://fatic.uvigo.es). Subscription to this platform, including a photograph, is mandatory. The website provides all the information related to the course. It also publishes continuous assessment grades and runs forums for students to exchange ideas and discuss doubts.</p> <p>Developed capabilities: CG3, CG5, CE13, CT3.</p>

Personalized attention

Methodologies	Description
Troubleshooting and / or exercises	Students will have the opportunity to attend personal tutorials in their lecturer's office. These tutorials can be individual or in reduced groups (typically with a maximum of 2-3 students). Previous appointment with the corresponding professor will be requested and fixed by email, preferably in the schedules and place established by lecturers at the beginning of the academic year and published on the course website.
Practice in computer rooms	Students will have the opportunity to attend personal tutorials in their lecturer's office. These tutorials can be individual or in reduced groups (typically with a maximum of 2-3 students). Previous appointment with the corresponding professor will be requested and fixed by email, preferably in the schedules and place established by lecturers at the beginning of the academic year and published on the course website.
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Tests	Description
Reports / memories of practice	Students will have the opportunity to attend personal tutorials in their lecturer's office. These tutorials can be individual or in reduced groups (typically with a maximum of 2-3 students). Previous appointment with the corresponding professor will be requested and fixed by email, preferably in the schedules and place established by lecturers at the beginning of the academic year and published on the course website.

Assessment

Description	Qualification	Training and Learning Results
Multiple choice tests	7.5	B3
Long answer tests and development	65	B3 C13 B5
Short answer tests	5	B3
Reports / memories of practice	22.5	B5

Other comments on the Evaluation

CONTINUOUS ASSESSMENT

The continuous assessment consists of several activities. If the student can not do them in the fixed date, this activity will not be evaluated. The grades of these activities will be valid only for the present academic course.

If the student sits for "Exam 1", she/he will be evaluated by continuous assessment. Furthermore, once the student has taken this exam, she/he will be considered to have attended this examination call. Qualification will be computed using the following criteria with no consideration if she/he takes the final exam or not.

Types and assessment of activities:

1. Exam 1 (Weight: 15%): weeks 7-8. It includes the subjects explained until this week.
2. Tests (Weight: 7.5%): developed along the course on the faitic website.
3. Exam of practices (Weight: 7.5%): week 6-7.
4. Short answer exam (Weight: 5%): week 13. It includes several subjects.
5. Lab project report (Weight: 15%): weeks 13 and 14.
6. Exam 2 (Weight: 50%): on the date of the final exam. It includes all the subjects, except those evaluated in the Exam 1 and the contents of lab projects.

In order to ensure that students acquire a balanced minimum on the subject competences, they will pass the course if they meet these two conditions:

- 1) get a final mark equal to or greater than 5 (on a ten-points scale)
- 2) and a score equal to or greater than 3.5 (on a ten-points scale) in each one of these two sets:

* assessment of sound-related scores

* assessment of image-related scores

Results for all assessment items will be announced as soon as possible.

NON CONTINUOUS ASSESSMENT

Students will be evaluated by means of an only exam, in the official date, if they don't do the [Exam 1]. The grades for this final exam are between 0 and 10 points. It includes all the subjects of the course, including the laboratory works.

In order to ensure that students acquire a balanced minimum on the subject competences, they will pass the course if they meet these two conditions:

1) get a final mark equal to or greater than 5 (on a ten-points scale)

2) and a score equal to or greater than 3.5 (on a ten-points scale) in each one of these two sets:

* assessment of sound-related scores

* assessment of image-related scores

Student can do the activities of Continuous Assessment, except the Exam 2.

Second opportunity exam:

⇒ **Students evaluated by Continuous Assessment can opt between two possibilities the same day of the exam:**

1. Do again the Exam 2 and be evaluated according what is stipulated for the system of [Continuous Assessment].
2. Be evaluated with a single final exam in the official date assigned by the Centre. The grades for this final exam are between 0 and 10 points. It includes all the subjects of the course, including the laboratory works. [Non Continuous Assessment] rules apply.

⇒ **Students not evaluated by Continuous Assessment:**

The grades for this final exam are between 0 and 10 points. It includes all the subjects of the course, including the laboratory works. [Non Continuous Assessment] rules apply. No other activities are assessed.

Sources of information

Finn Jacobsen et al., **FUNDAMENTALS OF ACOUSTICS AND NOISE CONTROL**,

Lawrence Kinsler, Austin Frey, Alán Coppens, James Sanders, **FUNDAMENTALS OF ACOUSTICS**,

R. J. Clarke, **Digital Compression of Still Images and Video**,

T. Perales Benito, **Radio y Televisión Digitales: Tecnología de los Sistemas DAB, DVB, IBUC y ATSC**,

Ulrich Reimers, **DVB : the family of international standards for digital video broadcasting**,

In addition to the previous bibliography, students will be provided with:

- * Documents for each subject: main material for an appropriate preparation of the course.
- * Documents with the project's contents for each practise session.
- * Copy of the graphic material used in the master sessions.
- * Problems proposed: A set of problems recommended for each subject.

Recommendations

Subjects that continue the syllabus

Room Acoustics/V05G300V01635

Fundamentals of Acoustics Engineering/V05G300V01531

Fundamentals of Image Processing/V05G300V01632

Sound Processing/V05G300V01634

Audio Systems/V05G300V01532

Imaging Systems/V05G300V01633

Audiovisual Technology/V05G300V01631

Video and Television/V05G300V01533

Subjects that are recommended to be taken simultaneously

Signal Transmission and Reception Techniques/V05G300V01404

Subjects that it is recommended to have taken before

Physics: Fields and Waves/V05G300V01202

Physics: Fundamentals of Mechanics and Thermodynamics/V05G300V01102

Digital Signal Processing/V05G300V01304

Electromagnetic Transmission/V05G300V01303
