

ACOUSTICS

20010 - ACOUSTICS (2024-25)

General

Code: 20010

Lecturer responsible:

RAMIS SORIANO, JAIME

Credits ECTS:

6,00

Theoretical credits:

1,20

Practical credits:

1,20

Distance-base hours:

3,60

Departments involved

- **Dept:** PHYSICS, ENGINEERING SYSTEMS AND SIGNAL THEORY

Area: APPLIED PHYSICS

Theoretical credits: 1,2

Practical credits: 1,2

This Dept. is responsible for the course.

This Dept. is responsible for the final mark record.

Study programmes where this course is taught

- [DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING](#)

Course type: COMPULSORY (Year: 2)

Competencies and objectives

Course context for academic year 2024-25

The Acoustic subject is basic in the Bachelor's degree in Engineering in Sound & Vision. Provides the theoretical concepts and principles of physics to develop specific skills grade.

The course depends on various subjects such as:

- Physical Foundations of Engineering I (20003)
- Basic Mathematics (20004)
- Physical Foundations of Engineering II (20008)
- Mathematics I (20009)

This set of courses provides tools that are necessary for the proper development and understanding of the Acoustics subject (20010). In addition, this course is coordinated with other subjects of the degree such as Acoustical Transducers, Insulation and Conditioning, Acoustical Design of Enclosures and Vibroacoustics, which are used in fundamental concepts of Acoustics.

UA Basic Transversal Competences

- **CT14** : Disposar de la capacitat d'autocrítica necessària per a l'anàlisi i millora de la qualitat d'un projecte.
- **CT7** : Capacitat d'exposició oral i escrita.

Specific Competences:>>Basic

- **B3** : Comprensió i domini dels conceptes bàsics sobre les lleis generals de la mecànica, termodinàmica, camps i ones i electromagnetisme i la seua aplicació per a la resolució de problemes propis de l'enginyeria.

Basic Transversal Competences

- **CT2** : Que els estudiants sàprien aplicar els seus coneixements al seu treball o vocació d'una forma professional i posseïsquen les competències que solen demostrar-se per mitjà de l'elaboració i defensa d'arguments i la resolució de problemes dins de la seua àrea d'estudi.
- **CT3** : Que els estudiants tinguen la capacitat de reunir i interpretar dades rellevants (normalment dins de la seua àrea d'estudi) per a emetre judicis que incloguen una reflexió sobre temes rellevants d'índole social, científica o ètica.
- **CT4** : Que els estudiants puguen transmetre informació, idees, problemes i solucions a un públic tant especialitzat com no especialitzat.
- **CT5** : Que els estudiants hagen desenvolupat aquelles habilitats d'aprenentatge necessàries per a emprendre estudis posteriors amb un alt grau d'autonomia.

**Specific Competences: >>
Competences Common to the
Telecommunications Branch**

- **C1** : Capacitat per a aprendre de manera autònoma nous coneixements i tècniques adequats per a la concepció, el desenvolupament o l'explotació de sistemes i serveis de telecomunicació.
- **C3** : Capacitat per a utilitzar eines informàtiques de recerca de recursos bibliogràfics o d'informació relacionada amb les telecomunicacions i l'electrònica.
- **C8** : Capacitat per a comprendre els mecanismes de propagació i transmissió d'ones electromagnètiques i acústiques, i els seus corresponents dispositius emissors i receptors.

**Specific Competences: >>
Competences Specific to Sound and
Image**

- **E1** : Capacitat de construir, explotar i gestionar serveis i aplicacions de telecomunicacions, enteses aquestes com a sistemes de captació, tractament analògic i digital, codificació, transport, representació, processament, emmagatzematge, reproducció, gestió i presentació de serveis audiovisuals i informació multimèdia.
- **E3** : Capacitat per a realitzar projectes de locals i instal·lacions destinats a la producció i enregistrament de senyals d'àudio i vídeo.
- **E4** : Capacitat per a realitzar projectes d'enginyeria acústica sobre aïllament i condicionament acústic de locals; instal·lacions de megafonia; especificació, anàlisi i selecció de transductors electroacústics; sistemes de mesurament, anàlisi i control de soroll i vibracions; acústica mediambiental, i sistemes d'acústica submarina.

Exclusive skill taught in this course

No data

Learning outcomes (Training objectives)

No data

Specific objectives stated by the academic staff for academic year 2024-25

Acquire the skills needed for a college student specialized in the field of Engineering in Sound and Image. The student will have a background in terms of basic scientific and technical training of and the basic knowledge of the laws and principles of acoustics, needed to access the understanding of different materials which will be held throughout the degree. Specifically:

- Acquire basic knowledge of vibration dynamics.
- To be able of defining what a sound wave is, how it propagates and to understand the phenomena of reflection, refraction, transmission and absorption.
- Study the behaviour of a sound source in terms of directivity.
- Acquire basic knowledge of sound wave propagation in tubes and learn how acoustic filters and resonators behaves.
- Knowing how hearing and speech is produced, emphasizing the physical aspects that are related with this phenomenon.
- Acquire the basic knowledge regarding sound environmental and to get closer to some of the parameters used for noise measurements.
- Knowing how sound waves propagate in water and their applications.
- Reinforce the concepts covered in laboratory.

Content for academic year 2024-25

THEMATIC BLOCK I: MECHANICAL OSCILLATIONS

1. Fundamentals of mechanical vibrations. Harmonic oscillations . Complex exponential solution. Damped oscillations . Forced oscillations . Mechanical impedance . An oscillator circuit . Linear combinations of harmonic vibrations . Competencies : B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .
2. Vibrations in strings. Free and rigid boundary conditions. Finite and infinity strings. Competencies: B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .
3. Vibrations in bars, membranes and plates . Longitudinal vibrations in bars. Transverse vibration in rods. Vibrations of membranes . Vibration plates. Competencies : B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .

THEMATIC BLOCK II: SOUND WAVES

4. Sound waves. Sound pressure . Wave equation. The propagation speed of sound in materials. Power and current sound. Effective sound pressure . Specific acoustic impedance. Power levels, intensity and sound pressure . Noise levels. Competencies: B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .
5. Propagation of sound waves. Transmission and reflection of sound waves. Absorption and attenuation of sound waves. Interference and Diffraction of sound waves. Radiation from a pulsating sphere . Directivity of a sound source. Radiation impedance. Environmental factors in the propagation of sound . Doppler Effect. Equivalent circuit for an oscillator. Helmholtz Resonator. Competencies: B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .

THEMATIC BLOCK IV: DISCIPLINES OF ACOUSTICS

6. Underwater Acoustics. Sound propagation in water. Reflection, refraction, transmission and absorption of sound in water. Channels sound. Applications of underwater acoustics. Competencies: B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .
7. Physiological Acoustics. Human ear anatomy and physiology of hearing. Sound perception. Loudness and loudness level. Hearing threshold. Audible sound spectrum. Octave band and third octave. Mechanism of the human voice. Competencies: B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .
8. Environmental acoustics. Sounds and noise. Types of noise. Sources of environmental noise. Effects of noise on health. Evaluation of the trouble caused by environmental noise. Competencies: B3 , C1 , C3 , C8 , E1 , E3 , E4 , CT2 to CT5 , CT7 , CT14 .

LABORATORY PRACTICES

1. Harmonic oscillations: The dynamic loudspeaker.
2. Vibrations of bars
3. Stationary sound waves in the Kundt tube.
4. Determining the speed of sound in air using a Helmholtz resonator.
5. Directivity of a sound source.

The schedule of all practical activities may be subject to changes due to the total or partial suspension of the face-to-face classes and/or due to states of alarm or situations related to sanitary emergency.

Related links

No data

Temas de acústica : ingeniería técnica de telecomunicación : especialidad sonido e imagen

Author(s): Durá Domenech, Antonio

Issue: Alicante : Publicaciones Universidad de Alicante, 2005;

ISBN: 84-7908-816-8

Category: Básico

Fundamentals of acoustics

Author(s): KINSLER, Lawrence E.

Issue: New York : John Wiley & Sons, 2000;

ISBN: 0-471-84789-5

Category: Básico

Ingeniería acústica

Author(s): Recuero López, Manuel

Issue: Madrid : Paraninfo, D.L.1999;

ISBN: 84-283-2639-8

Category: Complementario

Acústica arquitectónica aplicada

Author(s): Recuero López, Manuel

Issue: Madrid : Paraninfo, 1999;

ISBN: 84-283-2571-5

Category: Complementario

Acoustics : sound fields, transducers and vibration

Author(s): Beranek, Leo L. ; Mellow, Tim J.

Issue: London : Academic Press, 2019;

ISBN: 9780128152287 (libro e.)

Category: Complementario

Sound propagation : An impedance based approach

Author(s): Kim, Yang-Hann

Issue: - : Wiley, 2010;

ISBN: 978-0-470-82583-9

Category: Básico

Assessment

Assessment procedures and criteria 2024-25

Final assessment of the ordinary call (C2) of January

The final mark of the subject will be calculated as follows:

Final Mark = 30% (**FEM**) + 40% (**CEM**) + 25% (**LM**),

where:

FEM = Final Examination Mark

CEM = Continuous Evaluation Mark. The average score of the two mid-term exams:

LM = Laboratory Mark. 50% (laboratory notebook) + 50% (laboratory report).

The detection of copy or plagiarism will be marked "0" in the corresponding test. The Department and the Polytechnic School or Faculty will be informed about this incident. The reiteration in the conduct in this or other subject will entail the notification to the corresponding vice-rector of the faults committed so that they study the case and sanction according to the legislation.

Assistance to the laboratory is mandatory. It is considered that the student or the student has fulfilled the assistance requirement if a student has not missed more than 20% of the whole hours of laboratory practice. These faults, in any case, must be properly justified. The laboratory assessment is non-retrievable due to its face-to-face nature, its evaluation through group activities and the lack of availability of the necessary resources to evaluate the laboratory's knowledge without instrumentation.

Final qualification of extraordinary convocations (C1-C3) (December - July).

In the case of not having passed the subject in ordinary call will keep the notes of all the blocks (**CEM** and **LM**). The final mark will be the best of the following two options:

Option A:

Final Qualification (C1-C3) = 50% (**Final Exam Note C1-C3**) + 20% (**CEM**) + 30% (**LM**).

Option B:

Final Qualification (C1-C3) = 70% (**Final Exam Note C1-C3**) + 30% (**LM**).

Option B is designed for students who for justified reasons, work or illness, have not been able to attend lessons regularly.

Description	Criteria	Type	Weighting system
Mid-term exam	<p>Mid-term exams for continuous evaluation. Mid-term exams will contain a set of short questions (test and/or development type) (related to theoretical issues and some problems to be solved).</p> <p>The mid-term exams will be held during the following dates approximately:</p> <ul style="list-style-type: none"> - Week 8 approximately (corresponding to Units 1,2,3 and 4): 20% of the total grade for the subject (considering continuous evaluation). - Week 15 (corresponding to Units 5,6,7 and 8): 20% of the total grade for the course (considering continuous evaluation). 	ACTIVITIES OF EVALUATION DURING THE SEMESTER	40
Laboratory exam	The final laboratory exam will be done in the last laboratory session and will consist of a series of exercises and questions about the practices carried out.	ACTIVITIES OF EVALUATION DURING THE SEMESTER	15
Laboratory exams	<p>Ten days after the completion of the second session of each of the practices (of the first and last in the case of practice 5, Directivity of Sound Sources) the deadline for online delivery of the reports of practices will close (through a UACloud control).</p> <p>The reports will be delivered in pairs and will be evaluated according to the following points:</p> <ul style="list-style-type: none"> - Correct expression of experimental measures and procedures. - Correct expression of indirect measures. - Critical thinking and discussion of the results. - Cooperative group work and submission of reports following the deadlines. - Critical analysis of the work done. 	ACTIVITIES OF EVALUATION DURING THE SEMESTER	15
FINAL EXAMINATION	<p>Ordinary final examination of the subject.</p> <p>Attendance to the final examination is compulsory and it is also a necessary condition, although not sufficient, to obtain a mark of at least 4 points in this final examination in order to pass the subject.</p>	FINAL TEST	30

Official exam dates for academic year 2024-25

Exam session	Date	Time	Group - Classroom(s) allocated	Comments
(C2) Periodo ordinario para asignaturas de primer semestre	17/01/2025			Teoría
(C4) Pruebas extraordinarias para asignaturas de grado y máster	30/06/2025			Teoría

Academic staff



CARBAJO SAN MARTIN, JESUS

THEORY CLASS: Groups: 2
LAB PRACTICALS: Groups: 3
PROBLEM PRACTICALS / WORKSHOP: Groups: 2



LLORET GAONA, ALVARO

LAB PRACTICALS: Groups: 2 , 4



MENDEZ ALCARAZ, DAVID ISRAEL

THEORY CLASS: Groups: 1
LAB PRACTICALS: Groups: 1
PROBLEM PRACTICALS / WORKSHOP: Groups: 1

Groups

THEORY CLASS

Group	Semester	Morning or afternoon session	Language	No. of enrolled students	
Gr. 1 (THEORY CLASS) : 1 (ARA)	1S	Afternoon	English	12	<ul style="list-style-type: none">▪ Allowed INTERNATIONAL MOBILITY PROGRAMME▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING
Gr. 2 (THEORY CLASS) : 2	1S	Morning	Spanish	49	<ul style="list-style-type: none">▪ Allowed INTERNATIONAL MOBILITY PROGRAMME▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING

LAB PRACTICALS





Group	Semester	Morning or afternoon session	Language	No. of enrolled students	
Gr. 1 (LAB PRACTICALS) : 1 (ARA)	1S	Afternoon	English	13	<ul style="list-style-type: none">▪ Allowed INTERNATIONAL MOBILITY PROGRAMME▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING
Gr. 2 (LAB PRACTICALS) : 2	1S	Morning	Spanish	18	<ul style="list-style-type: none">▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING▪ Allowed INTERNATIONAL MOBILITY PROGRAMME
Gr. 3 (LAB PRACTICALS) : 3	1S	Morning	Spanish	14	<ul style="list-style-type: none">▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING▪ Allowed INTERNATIONAL MOBILITY PROGRAMME
Gr. 4 (LAB PRACTICALS) : 4	1S	Morning	Spanish	16	<ul style="list-style-type: none">▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING

PROBLEM PRACTICALS / WORKSHOP














Group	Semester	Morning or afternoon session	Language	No. of enrolled students	
Gr. 1 (PROBLEM PRACTICALS / WORKSHOP) : 1 (ARA)	1S	Afternoon	English	13	<ul style="list-style-type: none">▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING▪ Allowed INTERNATIONAL MOBILITY PROGRAMME
Gr. 2 (PROBLEM PRACTICALS / WORKSHOP) : 2	1S	Morning	Spanish	48	<ul style="list-style-type: none">▪ Allowed DEGREE IN SOUND AND IMAGE IN TELECOMMUNICATION ENGINEERING▪ Allowed INTERNATIONAL MOBILITY PROGRAMME




Timetables

THEORY CLASS


Group	Start date	End date	Day	Start time	End time	Lecture room
1	09/09/2024	20/12/2024	LUN	18:00	19:00	0016P2008 
1	09/09/2024	20/12/2024	MIE	16:00	17:00	0016P2008 
2	09/09/2024	20/12/2024	LUN	10:00	11:00	A2/C02 
2	09/09/2024	20/12/2024	MIE	11:30	12:30	A2/C02 

LAB PRACTICALS

Group	Start date	End date	Day	Start time	End time	Lecture room
1	25/09/2024	25/09/2024	MIE	17:00	18:30	0014PB001 
1	02/10/2024	02/10/2024	MIE	17:00	18:30	0014PB001 
1	16/10/2024	16/10/2024	MIE	17:00	18:30	0014PB001 
1	23/10/2024	23/10/2024	MIE	17:00	18:30	0014PB001 
1	06/11/2024	11/12/2024	MIE	17:00	18:30	0014PB001 
2	26/09/2024	03/10/2024	JUE	12:00	13:30	0014PB001 
2	17/10/2024	24/10/2024	JUE	12:00	13:30	0014PB001 
2	07/11/2024	12/12/2024	JUE	12:00	13:30	0014PB001 
3	23/09/2024	23/09/2024	LUN	08:30	10:00	0014PB001 
3	30/09/2024	30/09/2024	LUN	08:30	10:00	0014PB001 
3	14/10/2024	14/10/2024	LUN	08:30	10:00	0014PB001 
3	21/10/2024	21/10/2024	LUN	08:30	10:00	0014PB001 
3	04/11/2024	09/12/2024	LUN	08:30	10:00	0014PB001 

Group	Start date	End date	Day	Start time	End time	Lecture room
4	26/09/2024	03/10/2024	JUE	10:30	12:00	0014PB001 
4	17/10/2024	24/10/2024	JUE	10:30	12:00	0014PB001 
4	07/11/2024	12/12/2024	JUE	10:30	12:00	0014PB001 

PROBLEM PRACTICALS / WORKSHOP

Group	Start date	End date	Day	Start time	End time	Lecture room
1	09/09/2024	20/12/2024	LUN	19:00	20:00	0016P2008 
2	09/09/2024	20/12/2024	MIE	12:30	13:30	A2/C02 