

## Course guide

### 220223 - 220223 - Acoustics

Last modified: 02/04/2024

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 712 - EM - Department of Mechanical Engineering.

**Degree:** MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Optional subject).  
MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Optional subject).  
MASTER'S DEGREE IN SPACE AND AERONAUTICAL ENGINEERING (Syllabus 2016). (Optional subject).  
MASTER'S DEGREE IN RESEARCH IN MECHANICAL ENGINEERING (Syllabus 2021). (Optional subject).  
MASTER'S DEGREE IN MECHANICAL ENGINEERING RESEARCH (Syllabus 2024). (Optional subject).

**Academic year:** 2024    **ECTS Credits:** 3.0    **Languages:** English

#### LECTURER

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**Coordinating lecturer:** Andreu Balastegui

**Others:** Teresa Pàmies, Arnau Clot

#### TEACHING METHODOLOGY

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The course is divided into parts:

Theory classes.

Lab sessions.

Self-study for doing exercises and activities.

In the theory classes, teachers introduce the theoretical basics, concepts, methods and results and illustrate them with examples appropriate to facilitate their understanding. Teachers guide students in applying theoretical concepts to solve problems, always using critical reasoning. We propose that students solve exercises in and outside the classroom, to promote contact and use the basic tools needed to solve problems.

In the lab sessions, the teachers introduce the basic concepts of acoustic measurement and numerical simulations and assist the students.

Students, independently, need to work on the materials provided by teachers and the outcomes of the sessions of exercises, in order to assimilate the concepts.

The teachers provide the syllabus and monitoring of activities (by ATENEA).

#### LEARNING OBJECTIVES OF THE SUBJECT

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Basic concepts of acoustics across the whole knowledge chain of theory, simulation and measurements.

#### STUDY LOAD

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Type	Hours	Percentage
Self study	48,0	64.00
Hours large group	27,0	36.00

**Total learning time:** 75 h



## CONTENTS

### Module 1: Fundamentals of Acoustics

**Description:**

An introduction to the basic concepts of acoustics from the fundamental definitions and parameters to the outdoor propagation of sound.

**Related activities:**

Class exercises.

**Full-or-part-time:** 12h

Theory classes: 6h

Self study : 6h

### Module 2: Room Acoustics

**Description:**

An introduction to the basic concepts of the modal behaviour of sound in enclosures and noise insulation.

**Related activities:**

Class exercises.

**Full-or-part-time:** 14h

Theory classes: 8h

Self study : 6h

### Module 3: Computational Acoustics

**Description:**

SimCenter is a Finite Element software used to study noise and vibration for small and medium scale mechanical systems. A brief introduction to SimCenter will precede a series of practical sessions designed to acquire the basic knowledge needed to solve a proposed problem.

**Related activities:**

Lab session report.

**Full-or-part-time:** 25h

Theory classes: 7h

Self study : 18h

### Module 4: Measurement Techniques

**Description:**

An introduction to measurement instruments and international norms for noise assessment.

**Related activities:**

Lab session report.

**Full-or-part-time:** 10h

Theory classes: 2h

Self study : 8h



## Module 5: Project

### Description:

The students will have to perform a simulation of a proposed acoustical problem. The project will conclude with a written report.

### Related activities:

Project report.

### Full-or-part-time: 14h

Theory classes: 4h

Self study : 10h

## GRADING SYSTEM

Class exercises: 30%

Lab session reports: 30%

Project report: 40%

## BIBLIOGRAPHY

### Basic:

- Beranek, Leo L.; Mellow, Tim J. Acoustics: sound fields, transducers and vibration [on line]. 2nd ed. London: Academic Press, 2019 [ Consultation: 21/03/2023]. Available on : <https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9780128152270/acoustics>. ISBN 9780128152270.
- Kinsler, Lawrence E. Fundamentals of acoustics. 3rd. ed. New York [etc.]: John Wiley & Sons, 1982. ISBN 0471094102.
- Harris, Cyril M. Handbook of acoustical measurements and noise control. 3rd. Ed. Woodbury, [New York]: Acoustical Society of America, 1998. ISBN 156396774X.

### Complementary:

- Bies, Davies A.; Hansen, Colin H. Engineering noise control [on line]. 4th. ed. London: Spon Press, 2009 [Consultation: 03/05/2022]. Available on : <https://www-taylorfrancis-com.recursos.biblioteca.upc.edu/books/mono/10.1201/9781351228152/engineering-noise-control-david-bies-colin-hansen-carl-howard>. ISBN 9780415487061.