



# Course guide

## 3200961 - F1 - Physics I

**Last modified:** 19/04/2023

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering  
**Teaching unit:** 748 - FIS - Department of Physics.

**Degree:** BACHELOR'S DEGREE IN AUDIOVISUAL SYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 6.0    **Languages:** Catalan

### LECTURER

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**Coordinating lecturer:** JUANJO FERNÁNDEZ SOLER - RAMON HERRERO SIMÓN - CARMÉ HERVADA SALA - JORDI SELLARÈS GONZÁLEZ - M. DEL CARMEN TORRENT SERRA - JOSÉ FRANCISCO TRULL SILVESTRE - M. DEL CARMEN CASAS CASTILLO

**Others:**

### PRIOR SKILLS

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Students are expected to have achieved the level of physics required for the university entrance examinations (PAU).

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

CE03-ESAUD. Understanding and mastery of basic concepts about the general laws of mechanics, thermodynamics, fields and waves, and electromagnetism and their application for solving engineering problems. (Basic training module)

**Transversal:**

CT05 N1. Effective use of information resources - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

**Basic:**

CB1. That students have demonstrated possession and understanding of knowledge in a field of study that is based on general secondary education, and is typically found at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the forefront of their field of study.

### TEACHING METHODOLOGY

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- Face-to-face lecture sessions.
- Face-to-face practical work sessions.
- Independent learning and exercises.
- Preparation and completion of group activities subject to assessment.

In the face-to-face lecture sessions, the lecturer will introduce the basic theory, concepts, methods and results for the subject and use examples to facilitate students' understanding.

Students will be expected to study in their own time so that they are familiar with concepts and are able to solve the exercises set.



## LEARNING OBJECTIVES OF THE SUBJECT

To introduce some of the fundamental concepts of physics to gain a greater understanding of physical phenomena.  
To explain how the physical phenomena studied apply to the field of engineering.  
To familiarise students with critical thinking as a tool for problem solving.  
To familiarise students with various measurement techniques and instruments.

Familiarizing the student with the use of the critical reasoning as a tool for the resolution of problems.  
Familiarizing the student with the utilization of several instruments and techniques of measure.

## STUDY LOAD

| Type               | Hours | Percentage |
|--------------------|-------|------------|
| Hours large group  | 30,0  | 20.00      |
| Hours medium group | 15,0  | 10.00      |
| Hours small group  | 15,0  | 10.00      |
| Self study         | 90,0  | 60.00      |

**Total learning time:** 150 h

## CONTENTS

### Topic 1: OSCILLATION

#### Description:

- 1.1. Simple harmonic motion
- 1.2. Energy in simple harmonic motion
- 1.3. Oscillating systems
- 1.4. Damped oscillations
- 1.5. Forced oscillations and resonance

#### Related activities:

Theory classes.  
Problem-solving classes.  
Practical laboratory sessions for applying the theory covered for this topic

#### Full-or-part-time: 27h

Theory classes: 6h  
Practical classes: 3h  
Self study : 18h



## Topic 2: WAVE MOTION

### Description:

- 2.1. Simple wave motion
- 2.2. Periodic waves
- 2.3. Waves in three dimensions: acoustics
- 2.4. Waves and obstacles
- 2.5. Doppler effect

### Related activities:

Theory classes.  
Problem-solving classes.  
Practical laboratory sessions in which knowledge of the topic is applied.

### Full-or-part-time: 18h

Theory classes: 4h  
Practical classes: 2h  
Self study : 12h

## Topic 3: WAVE OVERLAP PHENOMENA

### Description:

- 3.1. Wave overlap
- 3.2. Standing waves.
- 3.3. Overlap of standing waves
- 3.4. Harmonic analysis and synthesis
- 3.5. Wave packets and dispersion
- 3.6. Applications: musical instruments

### Related activities:

Theory classes.  
Problem-solving classes.  
Practical laboratory sessions in which knowledge of the topic is applied.

### Full-or-part-time: 27h

Theory classes: 6h  
Practical classes: 3h  
Self study : 18h



#### Topic 4: ELECTROSTATICS

##### Description:

- 4.1. Electric field:
  - 4.1.1. Electric charges and the electric structure of matter. Conducting and insulating materials.
  - 4.1.2. Electric forces: Coulomb's law.
  - 4.1.3. Electric field lines.
  - 4.1.4. Electric flux. Gauss's law.
  - 4.1.5. Electric fields for different charge distributions (discrete and continuous)
  - 4.1.6. Field and charges in a conductor in electrostatic equilibrium
- 4.2. Electric potential:
  - 4.2.1. Potential electrostatic energy of a point charge
  - 4.2.2. Electric potential. Voltage.
  - 4.2.3. Equipotential surfaces.
  - 4.2.4. Potential of a conductor in electrostatic equilibrium
- 4.3. Capacity and dielectric:
  - 4.3.1. Polarisation of a dielectric
  - 4.3.2. Forces between charges in a dielectric
  - 4.3.3. Theorem of corresponding elements
  - 4.3.4. Capacity of a conductor
  - 4.3.5. Capacitors. Capacity of capacitors

##### Related activities:

- Theory classes.
- Problem-solving classes.
- Practical laboratory sessions in which knowledge of the topic is applied.

##### Full-or-part-time: 63h

- Theory classes: 14h
- Practical classes: 7h
- Self study : 42h

## ACTIVITIES

#### LABORATORY

- Full-or-part-time: 15h
- Laboratory classes: 15h

## GRADING SYSTEM

- Examinations: 75% (1st partial 37.5% and 2nd partial 37.5%)
- Laboratory sessions: 15%
- Works submitted and other proposed activities: 10%
- Retrieval of unsatisfactory results: there will a remedial of the 1st partial. Everybody will be able to take it. If the grade obtained in this remedial is greater than the grade of the 1st partial then this grade will be substituted by the grade of the remedial.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.

If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.



## BIBLIOGRAPHY

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### Basic:

- Tipler, Paul Allen; Mosca, Gene. Física per a la ciència i la tecnologia, vol. 1 [on line]. Barcelona [etc.]: Reverté, 2010 [Consultation: 17/06/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5758258>. ISBN 9788429144321.
- Tipler, Paul Allen; Mosca, Gene. Física per a la ciència i la tecnologia, vol. 2 [on line]. Barcelona [etc.]: Reverté, 2010 [Consultation: 17/06/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5758259>. ISBN 9788429144338.

### Complementary:

- Young, Hugh D. [et al.]. Física universitària [on line]. 13a ed. México D.F: Pearson Educación, 2013 [Consultation: 22/06/2022]. Available on: [https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=4618](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4618). ISBN 9786073221245.
- Feynman, R.P. Física. México D.F: Addison-Wesley, 1998. ISBN 9684443501.
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- Bloomfield, L.A. How things work, the physics of everyday life. 2nd ed. New York: John Wiley & Sons, 2001. ISBN 0471381519.