

## Course guide

### 3200962 - F2 - Physics II

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

**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)

**Basic:**

CB2. That students can apply their knowledge to their work or vocation in a professional manner and possess the competencies typically demonstrated through the development and defense of arguments and problem-solving within 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

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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
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours medium group	15,0	10.00
Hours large group	30,0	20.00

**Total learning time:** 150 h

## CONTENTS

### Topic 1: MAGNETOSTATICS

#### Description:

- 1.1. Magnetic field:
  - 1.1.1. Force exerted by a magnetic field
  - 1.1.2. Motion of a point charge in a uniform magnetic field
  - 1.1.3. Lorentz force and its applications.
  - 1.1.4. Action of a magnetic field on a current element, a current loop and a magnet coil.
  - 1.1.5. The Hall effect
- 1.2. Sources of magnetic fields:
  - 1.2.1. Magnetic fields produced by current elements. Biot-Savart law
  - 1.2.2. Magnetic field produced by a point charge in motion along an indefinite rectilinear current and a circular loop.
  - 1.2.3. Magnetic force between two parallel conductors. Definition of ampere and coulomb
  - 1.2.4. Ampère's law
  - 1.2.5. Magnetic field created by a coil
- 1.3. Magnetic properties of matter

#### Related activities:

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

**Full-or-part-time:** 40h 30m

Theory classes: 9h

Practical classes: 4h 30m

Self study : 27h

## Topic 2: MAGNETIC INDUCTION

### Description:

- 2.1. Magnetic flux.
- 2.2. Induced electromotive force and the Faraday Lenz law.
- 2.3. Motional electromotive force
- 2.4. Current sources
- 2.5. Foucault currents
- 2.6. Self-induction and mutual induction.
- 2.7. Magnetic energy.
- 2.8. Energy density of the electromagnetic field

### 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: ELECTROMAGNETIC WAVES

### Description:

- 3.1. Generalisation of Ampère's law. Displacement current
- 3.2. Maxwell's equations in a vacuum
- 3.3. Electromagnetic waves in a vacuum. Propagation speed.
- 3.4. Polarisation
- 3.5. Energy of an electromagnetic wave.
- 3.6. Electromagnetic spectrum

### 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 4: LIGHT

**Description:**

- 4.1. Wave-particle duality
- 4.2. Sources of light
- 4.3. Speed of light
- 4.4. Propagation of light
- 4.5. Reflection and refraction
- 4.6. Polarisation

**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 5: OPTICAL SYSTEMS

**Description:**

- 5.1. Mirrors
- 5.2. Lenses
- 5.3. Aberrations
- 5.4. Optical instruments

**Related activities:**

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

**Full-or-part-time:** 13h 30m

Theory classes: 3h  
Practical classes: 1h 30m  
Self study : 9h

## Topic 6: INTERFERENCE AND DIFFRACTION

### Description:

- 6.1. Phase difference and coherence
- 6.2. Thin-film interference
- 6.3. Double-slit interference
- 6.4. Single-slit diffraction
- 6.5. Phasors
- 6.6. Fresnel diffraction and Fraunhofer diffraction
- 6.7. Diffraction and resolution
- 6.8. Diffraction networks

### 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

## 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 be 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

### Basic:

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### Complementary:

- Young, Hugh D. [et al.]. Física universitaria [on line]. 13a ed. México D. F: Addison-Wesley, 2013 [Consultation: 22/06/2022].

Available

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- Hecht, Eugene. Óptica [on line]. 5ª ed. Madrid: Pearson, 2017 [Consultation: 20/09/2022]. Available on: [https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=6557](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6557). ISBN 9788490354926.

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