



## Course guide

### 3200031 - F1 - Physics I

Last modified: 11/04/2025

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

**Degree:** BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).  
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).  
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).  
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).  
BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Compulsory subject).  
BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2010). (Compulsory subject).

**Academic year:** 2025    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish

#### LECTURER

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

**Others:**

#### PRIOR SKILLS

It is considered that the students must have knowledge of General Physics of the level required to the PAU (national university entrance test).

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

##### Specific:

CENG2-DIDP. Understanding and mastery of basic concepts related to the general laws of mechanics, thermodynamics, fields and waves, and electromagnetism; and their application to solving engineering problems. (Basic training module).

CE02-INDUS. Understanding and mastery of the basic concepts of the general laws of mechanics, thermodynamics, fields and waves, and electromagnetism and their application to the resolution of engineering problems. (Basic training module)

##### Transversal:

CT04 N1. Teamwork - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

##### 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

- Face-to-face lecture sessions
- Lectures are given using digital presentations. The presentations will be made available to students on the virtual campus before classes begin to help them follow them. The assessment will be based on mid-semester examinations (or an optional final examination for students who fail the first one).
- Face-to-face practical work sessions

During practical work sessions, students work individually or in small groups of 2-3 on problems and questions under the lecturer's supervision. A collection of problems will be made available on the virtual campus. Systems for self-assessment (with assessment criteria or rubrics), co-assessment (among students) and delivery of reports, corrected by the teacher and returned, are made available to facilitate independent learning.

### Face-to-face laboratory work sessions

Students work in pairs during laboratory sessions. Guidelines for practicals will be made available to students on the virtual campus at the start of the course. Students must hand in a report for each practical. Marks will be based on the work carried out in the laboratory and the reports handed in.

## LEARNING OBJECTIVES OF THE SUBJECT

On completion of the course, students should be able to:

- Correctly use and interpret the language and basic concepts of Chemistry.
- Recognise the structure of matter and relate it to the physical and chemical properties of organic and inorganic substances.
- Apply stoichiometric calculations to solve problems.
- Recognise the equipment and apply the basic techniques of the chemistry laboratory.

## STUDY LOAD

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

**Total learning time:** 150 h

## CONTENTS

### TOPIC 1: KINEMATICS

#### Description:

- 1.1. Kinematic magnitudes.
- 1.2. Position, velocity and acceleration.
- 1.3. Coordinate systems.
- 1.4. Relative motion.
- 1.5. Particle motion.

#### 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 2: DYNAMICS

**Description:**

- 2.1. Newton's laws.
- 2.2. Forces.
- 2.3. Fictitious forces.

**Related activities:**

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

**Full-or-part-time:** 22h 30m

Theory classes: 5h  
Practical classes: 2h 30m  
Self study : 15h

## TOPIC 3: WORK AND ENERGY

**Description:**

- 3.1. Concept and calculation of work and variation of energy.
- 3.2. Kinetic, potential and mechanical energy.
- 3.3. Conservation of energy.

**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 4: PARTICLE SYSTEMS AND COLLISIONS

**Description:**

- 4.1. Conservation of linear momentum.
- 4.2. Centre of mass and centre of gravity.
- 4.3. Position and momentum of the centre of mass.
- 4.4. Centre-of-mass reference frame.
- 4.5. Kinetic energy of a particle system.
- 4.6. Impulse and collisions.

**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 5: RIGID BODIES

### Description:

- 5.1. Moment of force (3D).
- 5.2. Angular momentum.
- 5.3. Moment of inertia and angular acceleration.
- 5.4. Calculation of moments of inertia.
- 5.5. Kinetic energy of rotation.
- 5.6. Mechanical energy, work and power.
- 5.7. Rolling objects.

### 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 6: OSCILLATION (VIBRATION)

### Description:

- 6.1. Simple harmonic motion.
- 6.2. Energy in simple harmonic motion.
- 6.3. Superposition (1D and 2D) of simple harmonic motion.
- 6.4. Damped and driven oscillation.

### 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 7: WAVE MOTION

### Description:

- 7.1. Description of wave motion.
- 7.2. Harmonic waves.
- 7.3. Transmitted energy.
- 7.4. Wave interference.
- 7.5. Standing waves.
- 7.6. Sound waves.
- 7.7. Doppler effect.

### Related activities:

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

**Full-or-part-time:** 22h 30m

Theory classes: 5h

Practical classes: 2h 30m

Self study : 15h

## ACTIVITIES

### ACTIVITY 1: LABORATORY

**Full-or-part-time:** 15h

Laboratory classes: 15h

## GRADING SYSTEM

- Examinations: 75%

There will be 2 exams at least, each of them with a minimum percentage on the exams grade of 15%.

- Laboratory sessions: 15%

- Application/practicals: 10%

- Retrieval of unsatisfactory results: failed grade for midterm exams with a percentage higher than 25% of the global qualification could be recovered. The final exam cannot be recovered. The grade obtained by the application of the retrieval will replace the initial grade as long as it is higher, with no limitation in the maximum grade that can be obtained. Recovery will be carried out included in the final exam or in a specific recovery exam in class hours.

## EXAMINATION RULES.

To pass the subject, students must complete the laboratory practicals and hand in the necessary reports.



## BIBLIOGRAPHY

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### Basic:

- Sears, Francis W.; Zemansky, Mark W.; Young, Hugh D. Física universitaria [on line]. 13<sup>a</sup> ed. México D.F: Pearson Educación, 2013 [Consultation: 09/05/2022]. 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).

- Tipler, Paul Allen; Mosca, Gene. Física per a la ciència i la tecnologia, vol. 1 [on line]. Barcelona [etc.]: Reverté, 2010 [Consultation: 09/05/2022]. 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: 09/05/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5758259>. ISBN 9788429144338.

### Complementary:

- Feynman, Richard Phillips. Física (vol. 1 i 2). Buenos Aires: Addison-Wesley, 1987. ISBN 02010662.

- Giró, Antoni; Canales, Manel; Rey, Rossend; Sesé, Gemma; Trullàs, Joquim. Física per a estudiants d'informàtica [on line]. Barcelona: UOC, 2009 [Consultation: 09/05/2022]. Available on: <https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=3206945>. ISBN 8497881443.

- Bloomfield, Louis A. How things work: the physics of everyday life. 2nd ed. New York: John Wiley & Sons, 2001. ISBN 0471381519.

- Beer, Ferdinand Pierre [et al.]. Mecánica vectorial para ingenieros, vol. 1, estática [on line]. 11<sup>a</sup> ed. México: McGraw-Hill, 2017 [Consultation: 08/03/2023]. Available on: [https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=8077](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8077). ISBN 9781456255275.

- Beer, Ferdinand Pierre [et al.]. Mecánica vectorial para ingenieros, vol. 2, dinámica [on line]. 11<sup>a</sup> ed. México: McGraw-Hill, 2017 [Consultation: 08/03/2023]. Available on: [https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=8078](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=8078). ISBN 9781456255268.