COURSE DATA

Data Subject	
Code	34746
Name	Physics I
Cycle	Grade
ECTS Credits	6.0
Academic year	2023 - 2024

Study (s)

Degree	Center	Acad. year	Period
1401 - Degree in Chemical Engineering	School of Engineering	1	Second term

Subject-matter

Degree	Subject-matter	Character
1401 - Degree in Chemical Engineering	2 - Physics	Basic Training

Coordination

Name	Department
SORIA BARRES, GUILLEM PAU	345 - Earth Physics and Thermodynamics

SUMMARY

Physics I is a basic second term course of the first degree year. It is formed by theoretical lectures and problem-solving activities, which are taught at the classroom, and by laboratory sessions, which are taught in small groups at the laboratory of Physics.

A Physics course is present in all scientific and technical degrees. It encompasses a broad margin of subjects that become a fundamental help in the setting, comprehension and solution of typical engineering problems. Within the first degree year it is related to other courses such as Chemistry and Mathematics. In the following degree years, Physics I provides the basic knowledge for other course such as Energy and Mechanics of Fluids, Electrotechnics, and Applied Thermodynamics among others.

The **contents** of the course are: **Magnitudes, units and dimensional analysis, error estimation, mechanics, fluids,** and **thermodynamics.** They are structured in different thematic units as shown in section 6.

The main **objective** of the course is to provide the student with the basic knowledge of Physics that allows him to understand and explain typical engineering phenomena.

This objective can be divided in the following ones:

- The student must acquire a basic terminology in Physics that allows him to express himself with the precision required in the scientific and technical fields, relating concepts and applying them to the study of Chemical Engineering.
- The student must master the different procedures employed to solve different problems of Physical systems, including the necessary mathematical skills. The student must be able to interpret the solution and discuss its adequacy to the given problem.
- The student must acquire some background knowledge that is necessary for other courses of the degree, whether in the same degree year or in the following ones.
- To acquaint students to the experimental work in Physics, including the design and assembly of experimental set-ups, the taking of measurements, their mathematical treatment, their interpretation in terms of Physical laws and their communication as a scientific report.

Theoretical classes will be taught in Spanish and the practical and laboratory classes according to the subject information available on the degree website.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is recommended that the student has taken Physics and Mathematics courses in Secondary School.

OUTCOMES

1401 - Degree in Chemical Engineering

- G3 - Knowledge of basic and technological subjects that allows students to learn new methods and theories and provides them with versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making skills, creativity and critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of industrial engineering.

- B2 - Understanding and mastery of the basic concepts of the general laws of mechanics, thermodynamics, fields, waves and electromagnetism and of their application to solve engineering problems.

LEARNING OUTCOMES

1. Be able to evaluate clearly the orders of magnitude, evaluating the relative importance of the causes that occur in a physical phenomenon (CG3, CG4).
2. Know and comprehend the fundamentals of Physics as well as the mathematical skills needed for its formulation, the involved physical phenomena and its most relevant applications (CG3, CG4, B2).
3. Capability to solve problems, being able to identify the essential elements and to perform the required approximations (CG3, CG4, B2).
4. Be able to get deeper knowledge and understanding of the different branches of Physics from the basic concepts acquired in this subject, integrating mathematical formalisms and more complex concepts in the process (CG3, CG4, B2).
5. Be able to communicate information, ideas, problems and solutions through argumentation and reasoning (CG4).

DESCRIPTION OF CONTENTS

1. Introduction

Introduction to the course. Magnitudes and units. Dimensional analysis. Vectors. Systems of reference. Point particle and rigid body.

2. Kinematics and dynamics of point particles

Position, velocity and acceleration. Basic movements. Forces and Newton laws. Work and kinetic energy. Conservative forces and potential energy. Conservation of mechanical energy. Collisions and linear momentum conservation.

3. Kinematics and dynamics of rigid bodies

Vector description of circular motion. Translation and rotation in a plane. Dynamics of the translation of a system of particles. Torque. Fundamental equation of rotation dynamics. Rolling. Angular momentum and its conservation. Work and energy in rotation dynamics.

4. Statics of point particles and rigid bodies

Equilibrium of point particles. Equilibrium of rigid bodies. Aplications.

5. Introduction to Fluid Mechanics

Definition of a fluid. Pressure and compressibility. Fluid statics: Fundamental equation and Pascal principle. Buoyancy. Velocity field: Laminar and turbulent flow. Continuity equation. Bernoulli equation. Applications. [Extension: Surface effects. Viscosity.]

6. Thermodynamics

Thermodynamic system. Thermodynamic interactions in a simple system. Variables and equations of state. Temperature: Zeroth principle and empirical temperature. Systems in thermodynamic equilibrium: Compressibility and expansion, thermal equation of an ideal gas. Thermodynamic processes: Work and heat. First and second law of Thermodynamics. Heat engines. [Extension: Entropy.]

7. Introduction to the Physics laboratory

Errors as uncertainties. How to report a measurement. Estimation of uncertainties: direct measurements and propagation of uncertainties. Interpolation. Least-squares fitting.

WORKLOAD

ACTIVITY	Hours	% To be attended
Classroom practices	25,00	100
Theory classes	25,00	100
Laboratory practices	10,00	100
Development of group work	10,00	0
Development of individual work	10,00	0
Study and independent work	10,00	0
Preparation of evaluation activities	10,00	0
Preparing lectures	20,00	0
Preparation of practical classes and problem	20,00	0
Resolution of case studies	10,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The course is composed of two clearly differentiated parts:

- Theory and problems (classroom)
- Experimental work (laboratory)

In each part a different instruction method is followed.

Theory and problems:

In the term, there are on average four hours per week of classroom sessions that are equally divided between theoretical lectures and problem-solving sessions.

In theoretical lectures, the main concepts of the course will be introduced. Stress will be put on the practical applications of these concepts and some illustrative examples will be given. The participation of the students will be encouraged (CG3, B2).

A collection of problems for each unit will be given to the students. Some of these problems will be solved during the problem-solving sessions. At the end of each unit, some problems will be assigned to the students, so that they solve them individually and report them back. These problems will be evaluated to assess the progress of the students (CG3, CG4, B2).

Experimental work:

The experimental part of the course consists in four laboratory sessions, where the students will be divided into small groups (up to 16 students). The first session is devoted to the analysis of experimental data (uncertainties, graphics, fitting). In the following sessions, students will work, in pairs, in the laboratory. They will set up the experiment and make the measurements. After every session, every pair of students will write a report on the experiment, showing the experimental data and their analysis (uncertainties, graphs, fitting) as well as the conclusions derived from them (CG3, CG4, B2).

EVALUATION

Course evaluation is made considering its different parts:

1) Theory and problems

2) Experimental work

The evaluation of each part is done separately according to the criteria shown below.

a) Evaluation of theory and problems.

The course is divided into two main units:

1. Mechanics of the particle and the rigid body
2. Fluids and Thermodynamics

There are two basic ways of being evaluated:

Option A

This option includes:

1) Two partial exams at the end of each main unit (CG3, CG4, CG13):

- The first partial exam is scheduled at the end of the first main unit: Mechanics of the particle and the rigid body.
- The second partial evaluates the student performance in the second unit: Fluids and Thermodynamics. It is scheduled together with the final exam of option B.

Every exam will consist in a number of theoretical-practical questions.

2) The evaluation of the problems proposed to the student during the course (CG3, CG4, CG13).

In order to take part in the second partial it is necessary to have obtained a minimum mark of 3.0 (out of 10) in the first partial. If the mark is lower, the students will be evaluated by means of a final exam of the entire subject (modality B) in the first call. The mark of the second partial exam must also be higher than 3.0 to be able to average with the grade of the second partial exam. If the mark of the second partial is less than 3.0, it will be considered that the student has failed the course.

Option B

This option includes:

- A final exam at the end of the term (CG3, CG4, CG13). The exam will consist in a number of theoretical-practical questions.
- The evaluation of the problems proposed to the student during the course (CG3, CG4, CG13).

If the mark of the final exam is below 3.0 (out of 10), it will be considered that the student has failed the course.

IMPORTANT: in the second call, the only possible modality will be modality B.

b) Evaluation of experimental work

Experimental work is evaluated through the reports the students have written after every laboratory session (except for the first one, three in total) (CG3, CG4, CG13). The first session will be evaluated through the reports of the other three sessions. It is compulsory to attend the experimental sessions (compulsory and non-recoverable activity).

IMPORTANT: The mark obtained in the laboratory part must be equal to or greater than 5.0 (out of 10) in order to average with the mark for the theoretical part and pass the course. Otherwise, it will be considered that the student has failed the course.

FINAL EVALUATION

Option A

The final mark on the course is obtained from the maximum between:

1) The mark obtained in the proposed problems (10%), the average mark obtained in the partial exams at the end of each main unit (65%) and the average mark obtained in the laboratory reports (25%, activity compulsory and non-recoverable).

2) The average mark obtained in the partial exams at the end of each main unit (75%) and the average mark obtained in the laboratory reports (25%, activity compulsory and non-recoverable).

IMPORTANT: If the mark of the first partial exam is below 3.0, the student will be evaluated by option B.

Option B

The final mark on the course is obtained from the maximum between:

1) The mark obtained in the proposed problems (10%), the mark obtained in the final exam (65%) and the average mark obtained in the laboratory reports (25%, activity compulsory and non-recoverable).

2) The mark obtained in the final exam (75%) and the average mark obtained in the laboratory reports (25%, activity compulsory and non-recoverable).

IMPORTANT: If the mark of the final exam is below 3.0, it will be considered that the student has failed the course.

In any case, the evaluation system will be governed by the established in the Reglament d'Avaluació i Qualificació de la Universitat de València per a Títols de Grau i Màster (http://links.uv.es/7S40pjF)

REFERENCES

Basic

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- Giancoli D. C. Física para ciencias e ingeniería, volumen 1. Editorial Pearson. 4ª edición, 2008
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Additional

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