Universidad Zaragoza

Academic Year/course: 2022/23

26900 - Fundamentals of Physics I

Syllabus Information

Academic Year: 2022/23
Subject: 26900 - Fundamentals of Physics I
Faculty / School: 100 - Facultad de Ciencias
Degree: 447 - Degree in Physics
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Basic Education
Module:

1. General information

1.1. Aims of the course

The objective of the Fundamentals of Physics courses is to provide the student with a basic and homogeneous vision of general aspects of Physics that enable to take more specific courses. In particular, Fundamentals of Physics I focuses on acquiring basic tools for understanding the principles of classical mechanics and thermodynamics. Following the classic scheme of a general physics course the principles of kinematics and dynamics of a particle are presented. Newton's Laws are introduced. Concepts of work and energy are given. Previous concepts are extended to a system of particles. Finally we particularize to the concrete cases of a rigid solid and of deformable and fluid solids. In the second part of the course the concepts of temperature and heat, as well as the thermal properties of matter are given to finally formalize the first and second principles of Thermodynamics.

Among the objectives of the degree, this course has a special impact on the following:

O1. Provide theoretical and experimental knowledge of the general principles of physics and their most common techniques and instrumentation, with emphasis on those aspects of special relevance due to their conceptual importance or its visibility in the scientific, technological and social environment.

O2 Provide graduates with a versatile training that enables them to carry out activities of professional character in the scientific-technological field, including research, innovation and development activities within multidisciplinary teams.

The aims of the course are aligned with the following Sustainable Development Goals (SDGs):

- Goal 4: Quality Education
- Goal 8: Decent Work and Economic Growth

1.2. Context and importance of this course in the degree

This course is part of the ?basic? module of the degree of Physics and constitutes with Fundamentals of Physics II and Physics Laboratory Work the set of courses specifically devoted to the field of physics in the first year of the degree.

1.3. Recommendations to take this course

It is recommended to have followed pre-university courses on Physics and Mathematics.

2. Learning goals

2.1. Competences

Upon passing the course, the student will be more competent to:

- Use the basic notation and language of Physics
- Know the fundamental laws of physics and apply them in the right situations
- Distinguish between measurable physical magnitudes and derived physical magnitudes
- Describe the behavior of a mechanical system based on an analysis of both forces and energy
- Distinguish between conservative and dissipative interactions

- Apply to rigid solids the dynamics of particle systems
- Analyze the behavior of a fluid
- Derive some macroscopic properties of gaseous systems from the microscopic behavior
- Apply the principles of Thermodynamics correctly in simple systems

2.2. Learning goals

To pass this course, the student must demonstrate the following results:

- Calculate the trajectory of a particle when initial conditions of the movement and the acting forces are known.
- Solve the two bodies problem
- Analyze collisions using conservation theorems
- Describe physically the rotation of a rigid solid around an axis
- Identify the different fluid dynamics regimes
- Derive the equation of state of the ideal gas from the kinetic theory
- Calculate the performance of a thermal machine

2.3. Importance of learning goals

The course Fundamentals of Physics I is a fundamental element for the acquisition by the student of the competences of the degree. It is the first approximation of the student to the contents of Physics at the university, and in particular to the courses of Mechanics and Thermodynamics, which are central in Physics. This course is designed as a basic course and turns out, therefore, essential for obtaining the objectives of the degree.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

If continuous evaluation is chosen, there will be two stages:

1. A written exercise to be carried out in the first half of November and will cover the material taught in the first three blocks of the syllabus. This exercise will consist of both theory and problems. This exercise will constitute 30% of the final mark and will be eliminatory for those students who obtain a mark equal to or higher than 4.5. Students who do not achieve a 4.5 will have to take the single final exam.
2. An exam at the end of the course on the subject taught in blocks 4-8 of the syllabus, which will account for 70% of the total result. The exam will consist of both theory and problems. The final mark will be the weighted average (30%-70%) of the two exercises (November and end of course). In order to pass the course, this average must be equal to or higher than 5. Students with a grade higher than 4.5 in the first exercise who wish to take the final exam of this part again at the end of the course may do so. In this case, the highest mark of the two exercises corresponding to the first three blocks will be taken into account in the final mark.

Passing the subject by means of a single global exam:

The evaluation will be obtained directly from a single global exam. The exam will have two different parts: one on the first 3 blocks (which will account for 30% of the overall grade) of the programme and another on blocks 4-8 (which will complete the remaining 70%). In both parts there will be both theory and problems. In order to pass the exam, it will be necessary to obtain 5 points in the weighted average of both parts.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as:

- M1 Theoretical lectures: they present to the student the basic theoretical contents to achieve the associated technical competences (CE1, CE2, CE6).
- M2. Applications: show the application of the theoretical contents to specific cases.
- M3. Problem discussions: they allow to acquire technical skills from a practical point of view (CE1, CE2, CE6).
- M4. Exam: allows to evaluate the acquired competences and objectives of the course.

Students are expected to participate actively in class throughout the semester.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes the following learning tasks:

- Lectures: each section has a set of master lessons, in which the main concepts and general content is introduced.
- Applications: The applications develop the theoretical contents, extending them and showing their implementation in specific cases.
- Practice sessions (problems): problems of application of the contents of the section are solved in class, both by the teacher as of the students who voluntarily.
- Resolution of problems proposed in a group.
- Autonomous work and study.

4.3. Syllabus

The course will address the following topics:

Mechanics:

- Topic I: Kinematics.
- Topic II: Dynamics of a particle: Newton's laws.
- Topic III: Work and energy
- Topic IV: Dynamics of particle systems.
- Topic V: Dynamics of the rigid solid.
- Topic VI: Mechanics of deformable and fluid solids.

Thermodynamics:

- Topic VII: Temperature and heat. Thermal properties
- Topic VIII: First and second principles of Thermodynamics.

4.4. Course planning and calendar

The exam for the continuous evaluation will take place in the first half of November.

The final exam (for all students) will be held in January-February on the date designated by the Faculty of Science.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=26900