Universidad Zaragoza

Year : 2020/21

26900 - Fundamentals of Physics I

Syllabus Information

Academic Year: 2020/21
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.

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)

Final mark is given in a scale from 0 (lower mark) to 10 (higher mark). The student needs a 5 to pass the course.

The student must demonstrate that he has achieved the anticipated learning outcomes through a continuous evaluation (which will constitute up to 30% of the total result) and the examination test (at least the 70% of the total result).

a) Result of the continuous evaluation. It mainly evaluates the solution of a series of problems proposed throughout the course. For this, the following rules will be followed:

- The teacher will propose sequentially throughout the course a series of problems. Some of them will be solved in class; others must be individually solved and submitted by the student within the established period.
- Each student must submit at least the 75% of the requested problems. Otherwise, the student will be evaluated directly through the global test.
- To evaluate this activity, two written tests will be carried out throughout the semester. These tests shall consist on the total or partial resolution of a selection of problems among the proposed ones.
- Obtained mark can be modified, always in a positive way, by the participation and attitude of the student along the course. Class attendance is not mandatory but strongly recommended.

b) Result of the examination test: The examination will consist of two parts, one with theoretical questions, and the other with problems. Each one will be evaluated up to ten points. The result of the examination test will be the sum of the grade of the two parts, divided for two, except if the result of one of the two parts is less than three or the result of the test is less than four, in which case the course will be considered suspended.

c) Total result: will be obtained by multiplying the result of the continuous evaluation by 0.3, the result of the final exam by 0.7 and adding both amounts. The course is considered approved if the total result is equal to or greater than five, except for the cases referred above, in which the student is suspended for low performance in any part of the exam, or must pass a global evaluation for failing to comply with the conditions of the continuous evaluation. At any moment, a student may request to be evaluated only by the result of the single global test.

Success of the course through a single global test:

The evaluation will be obtained directly from an exam test: the exam will consist of two parts: theoretical questions and problems. Each one will be evaluated up to ten points. The total result will be the sum of both marks divided for two, except if the result of one of the two parts is less than four points, in which case the course will be considered failed.

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

Indicative dates of beginning of the activities of the different Topics:

- Topic I: mid September
- Topic II: first of October
- Topic III: end of October
- Topic IV: first of November
- Topic V: mid-November
- Topic VI: first of December
- Topic VII: mid-December
- Topic VIII: first of January

The problem collections correspond approximately to each of the proposed Topics and should be submitted on the established date (shortly after the completion of each Topic).

The exam for the continuous evaluation will be made at the beginning of the month of November (including problems about the 3 first Topic s of the course) and January (Topic s 4 to VIII).

Final exam will be at the end of January or starting February on the date designated by the School of Sciences.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Facultad de Ciencias web https://ciencias.unizar.es/grado-en-fisica-0

4.5.Bibliography and recommended resources