Universidad Zaragoza

Academic Year/course: 2024/25

25866 - Physics I

Syllabus Information

Academic year: 2024/25
Subject: 25866 - Physics I
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 558 - Bachelor's Degree in Industrial Design and Product Development Engineering
ECTS: 6.0
Year: 1
Semester: First semester o Second semester
Subject type: Basic Education
Module:

1. General information

Physics I focuses on the fundamentals of mechanics and its more applied aspects such as mechanical oscillations , elasticity and fluid mechanics. It also provides the basic concepts and principles of thermodynamics, mainly oriented to the study of heat transfer and energy analysis of machines and devices. Since this is a basic training subject, this knowledge is focused as a starting point for other subjects of the Industrial Branch and specific to the degree.

Although not strictly required, it is recommended to have completed the subjects "Physics and Chemistry" and "Physics" in high school, as well as to be proficient in the following mathematical tools:

- Complex numbers
- Trigonometry
- Analysis of elementary functions
- Differentiation and integration of functions of one variable

2. Learning results

In general, it is expected that by the end of the course, each student will:

1. Understand the fundamental concepts and laws of mechanics and thermodynamics and correctly apply them to basic engineering problems.
2. Analyze problems that integrate different aspects of Physics, recognizing the various physical foundations underlying a technical application, device, or real system.
3. Know the units and orders of magnitude of the defined physical quantities and solve basic engineering problems, expressing the numerical result in the appropriate physical units.
4. Correctly use basic experimental measurement or simulation methods, and process, present, and interpret the obtained data, relating them to the appropriate physical quantities and laws.
5. Use bibliography through any of the currently available means and use clear and precise language in their explanations on Physics issues.

These general outcomes should, in turn, be concretized into more specific achievements. Thus, it is expected that each student will:

1. Correctly apply the fundamental equations of mechanics to various fields of Physics and Engineering: dynamics of a rigid body, oscillations, elasticity, and fluids.
2. Understand the meaning, utility, and relationships between fundamental magnitudes, modules, and elastic coefficients used in solids and fluids.
3. Correctly perform mass and energy balances in fluid movements in the presence of basic devices.
4. Correctly use the concepts of temperature and heat and apply them to problems involving calorimetry, expansion, and heat transfer.
5. Apply the first and second laws of thermodynamics to processes, basic cycles, and heat engines.

3. Syllabus

Part I: Mechanics (Fundamentals)

1. Kinematics.

2. Dynamics of a particle.

3. Dynamics of a particle system.

4. The rigid solid.

Part II: Mechanics (Applications)

5. Simple mechanical oscillations.

6. Elasticity.

7. Fluid mechanics.

Part III: Thermodynamics

8. Heat and temperature.

9. First principle of thermodynamics. Processes.

10. Second principle of thermodynamics. Heat engines.

4. Academic activities

Lectures: 50 hours
Presentation of course content and problem-solving on the board.

Laboratory sessions: 10 hours
Experimental demonstration of some of the physical phenomena studied in the course.

Personal study: 84 hours

Assessment tests: 6 hours

5. Assessment system

A continuous assessment system, which will be carried out throughout the learning period. The final grade for the subject is calculated as follows:

1) Two intermediate midterm tests, consisting of the resolution of short questions and problems. Each one accounts for 40% of the total grade.

2) Laboratory sessions, which account for 20% of the total grade. They are evaluated on the basis of questionnaires given to at the end of each session. The total grade is the average of all the questionnaires, provided that all sessions are attended.

In order to pass the subject, it is necessary to obtain at least 5 points out of 10 in the final grade resulting from all the tests, **in addition to a minimum score of (a) 4 points out of 10 in each of the partial tests and (b) 5 points out of 10 in the laboratory practicals**. If conditions (a) and (b) are not met, the maximum grade that can be obtained is 4.6 points out of 10 (Fail).

Students who do not pass the subject through the continuous assessment system, or who wish to improve their grade, may take a global test, the date of which will be established in the academic calendar. It will consist of:

1) A written test with a structure analogous to that of the intermediate tests (up to 80% of the total grade, depending on the part of the grade already obtained that is used).

2) A practical laboratory exam, in which one of the proposed practices must be completed individually and without the teacher's help (20% of the total grade).

The conditions to pass the subject through the global test are identical to those of the continuous assessment.

Exceptionally, due to a legally recognized force majeure and after individual evaluation of the case by the University Office for Diversity Services, the practical laboratory exam in the global assessment may be replaced (with the same weight in the grade) by the submission of a written paper that demonstrates the achievement of general learning outcome 4 of the course.