Universidad Zaragoza

Academic Year/course: 2023/24

27002 - General physics

Syllabus Information

Academic year: 2023/24
Subject: 27002 - General physics
Faculty / School: 100 - Facultad de Ciencias
Degree: 453 - Degree in Mathematics
ECTS: 12.0
Year: 1
Semester: Annual
Subject type: Basic Education
Module:

1. General information

General Physics is a core subject within the degree program. Physics exemplifies the capabilities of mathematics to formalize natural phenomena, propose explanations, and enable the prediction of new phenomena. Mathematics has found material for its own development in the problems of physics. On the other hand, the increasing importance of mathematics as an applied science makes physics a source of inspiration and a challenge for mathematical thinking.

One of the objectives of this subject is to develop and expand students are already familiar with, such as particle kinematics and dynamics, Newton's laws , and concepts such as work and mechanical energy, electrostatics, magnetostatics and electric currents. Moreover, topics that may be new for students or at least, topics which may not have been studied previously, such as mechanics of deformable solids (fluids), the dynamics of rigid solids and systems of particles, waves or introduction to special relativity are also proposed.

General Physics is the only subject in the physics module and, in addition to its basic character, its contents will be directly relevant to those students who intend to take subjects in the astrodynamics module.

Attendance and active participation of students in class, as well as in other teaching activities such as problem solving, laboratory work, consultation with the teacher during tutoring hours, etc,. are strongly recommended.

The approaches and objectives of this module are aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda; the learning activities could contribute to some extent to the achievement of the goals 4 (quality education), 5 (gender equality), 8 (decent work and economic growth), and 10 (reducing inequality).

2. Learning results

- Calculate the particle trajectory given the forces involved and the initial conditions of the motion.
- Solve the two-body problem.
- Solve collision problems using conservation theorems.
- Analyze the motion of a rigid body around a rotational axis.
- Identify the different regimes of the fluid dynamics.
- Calculate electrostatic fields and potentials for a point source or a symmetric continuum body.
- Solve simple continuum current circuits.
- Calculate the interaction between magnetic fields and currents.
- Describe the phenomena associated to the propagation of an electromagnetic wave.
- Describe the geometric properties of the Lorentz's transform in a specific case.

3. Syllabus

1. Kinematics.
2. Dynamics of a particle. Newton's laws. Work and mechanical energy.
3. Dynamics of systems of particles. Conservation laws. Collisions.
4. Dynamics of rigid bodies.
5. Mechanics of deformable solids and fluids.
6. Gravitational interactions. Orbits.
7. Electrostatics.

8. Stationary electrical currents.
9. Magnetostatics.
10. Time-dependent electromagnetic fields.
11. Waves.
12. Introduction to the theory of relativity.

4. Academic activities

Master classes: 81 hours.
Problem solving: 27 hours.
Laboratory: 12 hours.
Project: 43 hours.
Study: 124 hours.
Assessment tests: 13 hours.

5. Assessment system

- There will be two written exams at the end of each semester corresponding to the contents given in each of them. If the student does not succeed any of them, the student must attend the following calls and take the exam of the whole course or of the part that has not been passed yet. The written exams consist of:
    - Problem solving exam (from 65% to 75% of the final grade).
    - Theory exam (from 25% to 35% of the final grade).
- Evaluation of the lab activity and lab questionaries. Weight 10% of the total grade. There will be lab exam for those students who do not attend the lab.
- Evaluation made along the academic course (class attendance and participation). Among the optional activities that can be evaluated are: preparing an essay on a selected topic from those suggested by the profesor and its oral presentation, individually o in small groups. Solving suggested problems that the students hand in. If that is the case there will be an evaluation of the essay, oral presentation and handed problems respectively. The weight of these activities in the final grade is 10%. In order for this grade to be computed in the final grade of each semester, the student must achieve a minimum grade of 4 out of 10 in the rest of the evaluation activities of the appropriate semester.

Without limiting the right that the student has, according to the current regulations, to assist and, if applicable, pass the subject by taking a global examination.