Universidad Zaragoza

Academic Year/course: 2021/22

30301 - Basic Principles of Physics

Syllabus Information

Academic Year: 2021/22
Subject: 30301 - Basic Principles of Physics
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Basic Education
Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process that has been designed for this course is based on the following:

1. Plenary lectures, given to the entire group, in which the instructor will explain the basics of the subject and will solve some selected problems. The participation of the students in this activity will be promoted through previous planning of selected problems. I.e., that will be introduced beforehand in the classroom so that the student can meditate about them and participate in their resolution.

2. Laboratory sessions distributed throughout the semester and the evaluation of which will be part of the final exam score. Groups of two or three students are formed so as to work on each experimental set-up, with the help of a guide previously provided to the students together with a questionnaire that collects the experimental data and their analysis.

3. Activities in small groups which can be: seminars on topics of interest for the degree, experimental practical work, supervised resolution of problems, etc.

4. Personal work, a home study of the theory and its application to problem-solving. This activity is fundamental in the learning process of the student and to succeed in the evaluation process.

5. Tutorials, which can be related to any part of the course program. The instructor will give a personal appointment to the student who will make specific questions previously pondered.

4.2. Learning tasks

The program offered to the student to help him in achieving the expected results includes the following activities

Lectures. They will take place during the semester with a rate of 3 hours per week as scheduled by the faculty. The attendance is non-mandatory but highly recommended for a good learning process.

Problem discussion sessions. They will take place during the semester consisting of one hour in alternate weeks according to the faculty schedule and will be devoted to the overall resolution of medium-high level exercises. Laboratory sessions. 5 laboratory sessions of two hours will be scheduled. The students will join in subgroups of two or three people. Attending the lab sessions is mandatory. The evaluation consists of a final practical exam. A guide will be previously provided to the students together with a questionnaire that collects the experimental data and their analysis The faculty will schedule and communicate the laboratory sessions calendar at the beginning of the course.

Small group activities. Meetings of small student groups will be encouraged to solve problems, review laboratory works and

supervised projects.

Study and personal work. This is the individual personal work part of the course. 100 hours are estimated as necessary for the study of theory, problem-solving and laboratory reviewing redactions altogether.

Tutorials. The instructors will publish a timetable for students reception to attend to questions and doubts in a regular way during the whole semester

4.3. Syllabus

Basic Principles of Physics
Degree of Engineering Technologies and Telecommunication Services
Course program 2019-2020

Part I. MECHANICS and THERMODYNAMICS

1. **Kinematics and dynamics of one particle**

- Position, velocity, and acceleration vectors.
- Cartesian, polar and intrinsic coordinates.
- Newton laws.
- Linear and angular Momentum.
- Work, kinetic energy and potential energy.
- Momentum and energy conservation laws.
- Periodic movements: Simple harmonic motion.
- Anharmonic Oscillations: small oscillations.
- Dumped and forced oscillations: resonance.

2. Thermodynamics

- Many particle systems: heat, work and temperature.
- Heat conduction.

PART II. ELECTRICITY and MAGNETISM

3. Electrostatic field.

- Coulomb's law.
- Electrostatic field. Field force lines.
- Continuous charge distributions.
- Gauss law.

4. Electrostatic Potential

- Conservative character of the electrostatic field: electrostatic potential.
- Equipotential surfaces. The electric field gradient.
- Electrostatic energy of a charge distribution.

5. Electrical conductors

- Conductors in electrostatic equilibrium
- Charge distribution: shielding and ground connection.
- Capacity: capacitors.
- Electrostatic energy density.

6. Electric current

- Ohm's law: resistance.
- Electric current density: microscopic Ohm's law.

7. Magnetic induction

- Lorentz force on moving charges.
- Forces on wires
- Magnetic moment of a coil
- Biot and Savart?s law
- Ampere?s law

8. Electromagnetic induction

- Lenz law

- Faraday law
- Self and mutual induction

LABORATORY SESSIONS

? Session 1: Introduction to experimental work.

? Session 2: Oscillatory motion of the simple pendulum: harmonic and anharmonic

? Session 3: Determination of equipotential lines of an electric field

? Session 4: I/v curves in DC circuits.

? Session 5: Measurement of magnetic fields by using a Hall sensor.

4.4. Course planning and calendar

Scheduling sessions and presentation of works

Lectures, problem discussion classes and laboratory sessions will be held according to the schedule established by the faculty and published prior to the beginning of the course.
Each instructor will provide his own timetable of tutorials and deadlines for a work presentation.

All the information will be available online up to date, through the Moodle platform

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30301