Universidad Zaragoza

Academic Year/course: 2021/22

30705 - Physics 2

Syllabus Information

Academic Year: 2021/22
Subject: 30705 - Physics 2
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 470 - Bachelor's Degree in Architecture Studies
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Basic Education
Module:

1. General information

1.1. Aims of the course

Physics 2 is a part of the basic training of the Architecture Degree syllabus. It is a compulsory subject of 6 ECTS in the second semester of the first academic year of the Degree.

Together with Physics 1 in the first semester, Physics 2 gives an introduction to Physics that provides with basic scientific knowledge of the fundamental laws of Nature and that should serve as a basis for technical subjects of more advanced courses.

The first section covers the fundamentals of electric field and current concepts; then the basic mechanisms of heat transmission as well as an introduction to the thermal machines and heat engines is presented. The next section is focused on wave propagation, where the nature and characteristics of sound and light are emphasized. Finally, in the last part of the semester, some basic concepts of geometrical and wave optics are studied.

1.2. Context and importance of this course in the degree

On the one hand, the acquired knowledge should serve as a basis for subjects of later courses of the degree (*such as "Conditioning, services and facilities"*) related to the evaluation of the energy cost of buildings, safety problems or comfort features.

On the other hand, and more generally, the activities carried out imply the development of reasoning, analysis and synthesis, and problem solving capacities.

1.3. Recommendations to take this course

Class attendance is a FUNDAMENTAL factor in the follow-up of this subject. The experience acquired in recent academic years shows a strong correlation between the ACTIVE student attendance with the final results achieved.

The study and continuous work are essential to achieve an adequate mastery of the theoretical contents, and their application in problem solving and laboratory sessions. When studying physics, usually many doubts arise that it is important to solve as soon as possible to guarantee the correct progress. The student has the support of the teacher, both during the classes and in the scheduled tutoring sessions, individually or in small groups.

2. Learning goals

3. Assessment (1st and 2nd call)

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 lectures, problem-solving sessions, exams, laboratory sessions, and assignments.

4.2. Learning tasks

This course is organized as follows:

- **Lectures** will focus on the explanation of the physical principles as well as on the resolution of selected problems. At the beginning of the lecture the teacher will make a brief presentation of the topic, referring it to a more general context and highlighting the relationships with other items. Applications of the studied concepts will be emphasized throughout each session giving general guidelines for problem-solving.
- **Problem-solving sessions**. During problem-solving sessions, the students' participation is promoted. The students are encouraged to solve some selected problems and explain them to the class group. Besides, dialogue will be promoted so that the questions/answers of the students allow the teacher to be aware of the learning progress of the group.
- **Exams** throughout the semester assessment tests will be conducted in order to check the understanding of the topics under study.
- **Laboratory sessions**, in which the students must carry out simple physics experiments, under the teacher supervision, and the support of a lab guide. Students must prepare a lab report for each experiment including their experimental results as well as data analysis and a brief discussion. The student will have a guide of the lab experiences, including instructions about the proper presentation of the results. The group is divided into subgroups of about 14-16 members. The lab experiences are carried out in pairs. The laboratory sessions are designed according to the theory program.
- **Assignments.** Throughout the semester students may be asked to prepare some academic works to be submitted in writing and presented in an interview with the teacher. Students can autonomously solve some selected problems (of an appropriate level for 1st-year students) previously authorized by the teacher and under his supervision. The written report must be submitted in advance of the compulsory oral presentation.
- **Tutorials.** Tutorial support is offered to the students, who can book an appointment with the teacher to solve any question concerning the program topics.

4.3. Syllabus

This course will address the following topics:

Section I. Electric Fields and Currents

Topic A. Electric Field and Electric Potential

1. Coulomb?s Law
2. Electric Flux and Gauss?s Theorem
3. Electric Potential
4. Conductors and Dielectric Materials. Capacitors

Topic B. Electric Currents

1. Ohm?s Laws
2. Joule Effect and Energy Dissipation
3. Introduction to elementary circuit theory

Section II. Thermodynamics and Calorimetry

Topic A. Heat and Temperature

1. Temperature. Thermal Expansion. Thermal Stress
2. Specific Heat and Thermal Capacity
3. Mechanisms of Heat Transmission. Fourier?s Equation

Topic B. Thermodynamics and Thermal Machines

1. Work and Heat in Thermodynamics
2. The First Law of Thermodynamics: Thermodynamic Processes
3. The Second Law of Thermodynamics: Thermodynamic Cycles. Thermal Engines

Section III. Oscillatory Motion and Waves.

1. Nature of the Waves
2. Waves Superposition Principle
3. Sound Waves. Intensity of Sound. Tone and Timbre
4. Reverberation. Sound Absorption. Sound Insulation

Section IV. Light and Colour

1. The Nature of Light. Electromagnetic Waves
2. Reflection and Refraction
3. Geometrical Optics
4. Light Dispersion. Polarization. Interference
5. Photometry and Colourimetry

4.4. Course planning and calendar

Lectures (3 or 4 hours a week, on alternate weeks) and laboratory sessions (2 hours a week on alternate weeks for each subgroup) are taught according to the schedule established, published well in advance of the beginning of the term.

The lab experience reports have to be delivered at the end of the corresponding laboratory session.

Appointments for oral presentations of the complementary academic tasks will be set up in accordance with the students.

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 College of Higher Engineering and Architecture (EINA) website (https://eina.unizar.es/) and Moodle.

4.5. Bibliography and recommended resources

Library link