Universidad Zaragoza

Year : 2019/20

30700 - Physics

Syllabus Information

Academic Year: 2019/20
Subject: 30700 - Physics
Faculty / School: 110 -

Degree: 470 - Bachelor's Degree in Architecture Studies

ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Basic Education
Module:

1.General information

1.1.Aims of the course

Physics 1 is a part of the basic training block of the Degree program in Architecture Studies. It is a compulsory subject of 6 ECTS taught in the second semester of the first academic year of the Degree.

This subject (together with Physics 2, in the second semester) corresponds to an introductory course in physics that, in addition to providing basic scientific knowledge of the fundamental laws of physics, serves as a pillar for the technical subjects studied in higher courses of the degree of Architecture. It begins by reviewing the concepts of particle dynamics, a subject in principle already known that allows us to establish a common language in which the whole subject will be developed. The next step is to introduce basics of dynamics of particle systems that will be applied fundamentally to the study of the rigid solid. In this central block of the subject the study of rigid solids in equilibrium and the management of concepts of mass geometry constitutes a fundamental aspect. Finally, in the last part of the semester, some basic concepts related to the elastic behaviour of solids and the properties of fluids are introduced.

1.2.Context and importance of this course in the degree

On the one hand the acquired knowledge serves as a basis for subjects of advanced 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

The ACTIVE student attendance of the classes is a FUNDAMENTAL factor in the follow-up of this subject.

Before the beginning of the classes, it is strongly recommended to read and complete the questionnaire of the ZERO COURSE of PHYSICS (accessible via Moodle), complemented by the review of the topics in which a lack of knowledge is detected.

The study and continuous work are essential to achieve an adequate mastery of the theoretical contents and their application in problems and lab sessions. When studying physics, usually many doubts arise that it is important to solve them 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, individual or in small groups.

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that is designed for this subject is based on the following:

- Theory sessions will focus on the explanation of the physical principles as well as on the resolution of selected problems.

- Problem solving lessons, devoted to topics belonging to one determined program section. (See the program)

- 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 the experimental results as well as data analysis and a brief discussion

- Throughout the semester, some academic task are proposed to the students; to be submitted in writing and presented in an interview with the teacher.

4.2.Learning tasks

The scheduled activities to achieve the expected learning results are:

Theory and problem sessions

At the beginning of each lecture the teacher will make a brief presentation of the subject, 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 the guidelines for problem solving.

During problem solving sessions the active participation of the students is pursued. 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 should allow the teacher to be aware of the learning progress of the group.

Laboratory sessions

Students are divided into subgroups of approximately 14 or 16 members. The lab experiences are carried out in pairs.

The laboratory sessions are designed according to the theory program. The student will have a guide of the lab experiences, including instructions about the proper presentation of the results.

Complementary academic tasks and oral presentations

Students can autonomously solve some selected problems (of appropriate level for 1st year students) previously authorized by the teacher and under his/her supervision. The written report must be submitted in advance of the compulsory oral presentation.

Tutorial support

Tutorial support is offered to the students, who can book an appointment with the teacher to solve any question concerning the program items.

4.3.Syllabus

Introduction

1. Physical Magnitudes and Units. Dimensional Identities. Measures and Errors.

Principles of Single Particle Mechanics

1. Kinetics of a Single Particle.
2. Newton?s Laws.
3. Types of Forces: Applied Forces, Reaction Forces. Torque.
4. Force Diagrams. Equilibrium of a Particle.
5. Linear and Angular Momenta. Dynamics of a Single Particle.
6. Work and Energy. The Conservation of Energy.

Oscillatory Motion

1. Simple Harmonic Motion.

2. Free Damped Oscillations.
3. Forced Damped Oscillations and Resonance.
4. Small Oscillations.

Mechanics of Many Particle Systems

A. Dynamics

1. Motion of a Many Particle System. Linear momentum of a Many Body System. Centre of Mass.
2. Rigid Body. Rotation around a Fixed Axe. Moment of Inertia. Steiner's Theorem.
3. Equation of Motion of a Rigid Body.

B. Statics of a Rigid Body

1. Equilibrium condition. Types of Reaction Forces.
2. Equivalent Force Systems. Centre of the Force.
3. Internal Stresses.

Introduction to Elasticity

1. Stress and Strain. Elasticity Modules.

Fluid Mechanics

A. Statics

1. Fundamental Equations. Hydrostatic Pressure. Pascal?s Principle.
2. Buoyant Forces and Archimede?s Principle. Buoyancy.

B. Fluid dynamics

1. Ideal Fluids. Bernouilli?s Equation. Forces in Pipes.
2. Viscous Fluids. Poiseuille?s Equation. Real Fluids.

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 scheduled (the calendar is published well in advance of the beginning of the term).

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

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

4.5.Bibliography and recommended resources

Main Text of Reference

- Sears-Zemansky-Young-Freedman, *University Physics*, Vol.1, Ed. Pearson Addison Wesley, 13th Ed.

Alternative Choices

- P. Tipler, G. Mosca, *Physics for Scientists and Engineers*, Vol. 1 (Mechanics, Oscillations and Waves, Thermodynamics) 6th Ed.
- R. A. Serway, J. W. Jewett, *Physics*, Vol. 1, (Mechanics, Oscillations and Waves, Thermodynamics), Ed. Thomson, 7th Ed.

Complementary Bibliography for Specific Aspects of the Course:

- M. Vázquez, E. López, *Mecánica para Ingenieros. Estática-dinámica,* Ed. Noela*,* 7ª ed., 1998.
- F.P. Beer, E.R. Johnston. *Vector Mechanics for Engineers*. McGraw Hill