Universidad Zaragoza

Year : 2019/20

28601 - Physics I: general mecanichs

Syllabus Information

Academic Year: 2019/20
Subject: 28601 - Physics I: general mecanichs
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 422 - Bachelor's Degree in Building Engineering
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

The foreseen outcomes of this signature are based on the following approaches and objectives:

- Comprehension of the concepts and fundamental laws of mechanics, waves and thermodynamics, and their implementation in basic problems arising from the Engineering and Architecture.
- Analysis of problems related to different aspects of the Physics, recognizing the multiple Physics foundations underlying technical implementations, devices and real systems.
- Comprehension of the units of measurements and order of magnitude of the physical magnitudes in use, implementing them in problem solving related to Engineering and Architectural aspects and using the right numerical values with the right units of measurements.
- Correct use of the basic mathematical methods and reasoning for experimental measurements and simulations processing, expressing and interpreting the gathered data and relating them to their appropriate magnitudes and underlying physical laws.
- Correct use of the bibliography available with a critic mind and focus, using a technical language with clear ideas and concepts in order to explain and debate about issues of the underlying Physics and knowledges related to it.
- Correct implementation and use of the multiple equations provided by the Physics under study to fields such as the Civil Enginering and Architecture.
- Comprehension of the meaning, right use and relationship among the multiple physical magnitudes in use.
- Correct use and distinction between temperature and heat, meaning their right implementation in calorimetry problems such as thermal expansion and heat conduction in materials and structures.
- Implementation of the Thermodynamic Principles to different kind of thermal process, basic cycles and heat engines.
- Comprehension, interpretation and correct description of wave phenomena.

1.2.Context and importance of this course in the degree

This subject is part of the basic structure of academic knowledges required for the students to overcome with success this academic degree. It is a compulsory subject being taught in the first semester in the first course with 6 ECTS.

1.3.Recommendations to take this course

It is advisable for the students to have a good knowledge in General Physics and Mathematics equivalent to the curricula given in Secondary Education in the European Union. In outline, students should have knowledges of Linear Algebra, Vector Calculus and Integral and Differential Calculus in Mathematics, and also of physical concepts related to Kinematics, Dynamics, Statics, Fluid Statics, Thermodynamics, Waves and Acoustics in Physics; also, it is highly recommended a good capability and skill in problem solving.

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 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 theory sessions, practice sessions, laboratory workshops and tutorials.

Strong interaction between the teacher and the student is promoted. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

The course "Física I: mecánica general" is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities.

Regarding the slides, proposed exercise photocopies, laboratory session guides and other materials used in class, all of them will be available on the Moodle platform of this course or at the Photocopying Service of the centre.

Material	Format
Topic theory notes Topic problems	Paper/repository
Topic theory notes Topic presentations Topic problems Related links	Digital/Moodle E-mail
Educational software	Open source Maxima and Octave

4.2.Learning tasks

This 6 ECTS (150 hours) course is organized as follows:

- **Theory sessions**: (3 ECTS: 30 h). 4h per week. Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the course are displayed, highlighting the fundamental, structuring them in topics and or sections, interrelating them.
- **Practice sessions**: (2 ECTS: 20 h) Problems and practical cases are carried out, complementary to the theoretical concepts studied.
- **Laboratory workshop**: (1 ECTS: 10 h). 2h per week. The lecture group is divided up into various groups, according to the number of registered students, but never with more than 20 students, in order to make up smaller sized groups.
- **Individual Tutorials**: Those carried out giving individual, personalized attention with a teacher from the department. These tutorials may be in person or online.
- **Exams**. (6 hours). One hour per test. The written assessment tests will be related to the following topics:
    - **Test 1**: Kinematics, Dynamics of a particle and several particles, Work, power and energy.
    - **Test 2**: System of particles, Dynamic of rigid bodies, Statics of particles and rigid bodies, Fluid statics and dynamics.
    - **Test 3**: Oscillatory motion, Waves, Acoustics, Thermodynamics.
- **Autonomous work and study** (90 hours).
    - Study and understanding of the theory taught in the lectures.
    - Understanding and assimilation of the problems and practical cases solved in the practical classes.

- Preparation of seminars, solutions to proposed problems, etc.
- Preparation of laboratory workshops, preparation of summaries and reports.
- Preparation of the written tests for continuous assessment and final exams.

4.3.Syllabus

This course will address the following topics:

An estimated timetable of lectures

1. Units of measurements and vectors. Coordinate systems.
2. Kinematics: distance and displacement, velocity and speed, acceleration.
3. Kinematics: motion in two and three dimensions (linear, parabolic, circular, harmonic, among others).
4. Dynamics: Newton's laws, forces in nature, particle motion, work, power and energy. Conservation of energy. Stokes' law.
5. System of particles. Conservation of energy and linear momentum.
6. Dynamics of a rigid body: rotation motion, mass moment of inertia, rotational kinetic energy. Conservation of angular momentum.
7. Statics of a particle and a rigid body: centre of gravity, conditions for equilibrium, equilibrium in an accelerated frame.
8. Fluid statics and dynamics: density, pressure, buoyancy and Archimedes' Principle, Fluids in motion.
9. Oscillatory motion: simple harmonic motion, energy in simple harmonic motion, damped oscillations, driven oscillations and resonance.
10. Waves and wave phenomena: properties of a wave, equations, superposition, standing waves.
11. Acoustics and resonance: sound waves, the Doppler Effect.
12. Thermodynamics: temperature and thermal equilibrium, temperature scales, the ideal-gas law.
13. Heat and the First Law of Thermodynamics. The internal energy of an ideal gas. Work and the PV diagram for an ideal gas. Thermodynamical processes.
14. The second law of Thermodynamics. Heat engines, refrigerators, the Carnot engine. Applications.
15. Revision activities for the final exam.

This course is required for physics majors and all students in architecture and engineering. It will introduce the concepts and practice of Physics. The topics and tools presented here provide the foundation needed in any architecture course. This course will cover elementary mechanics of particles and rigid bodies, Newton's laws, work and energy, and conservation of momentum and energy, among others.

4.4.Course planning and calendar

Further information concerning the timetable (horario de clases), classroom, office hours, assessment dates (distribución de exámenes) and other details regarding this course will be provided on the first day of class or please refer to the Faculty of EUPLA website and Moodle.

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=28601&year=2019