Physics I

Academic Year: (2022 / 2023) **Review date: 21/05/2022 18:32:07**

Department assigned to the subject: Physics Department

Coordinating teacher: MUÑOZ CASTELLANOS, ANGEL

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 1

Branch of knowledge: Engineering and Architecture

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Initiation to the differential and integral calculus and also vector calculus. Furthernore, good knowledge in trigonometry.
It is recommended to take the zero course in physics offered by our university to new students in all engineering degrees.

OBJECTIVES

By the end of this subject, students will be able to have:
1. Have knowledge and understanding of the physical principles of mechanics and thermodynamics
2. Have the ability to apply their knowledge and understanding in order to identify, formulate and solve problems of mechanics and thermodynamics using established methods
3. Have the ability to design and perform mechanical and thermodynamic experiments, in order to interpret the data obtained and draw conclusions from them.
4. Have laboratory equipment management skills for data collection in mechanics and thermodynamics practices
5. Have the ability to select and use appropriate tools and methods to solve problems of mechanics and thermodynamics
6. Have the ability to combine theory and practice to solve problems of mechanics and thermodynamics

DESCRIPTION OF CONTENTS: PROGRAMME

1. Kinematics of a particle and relative motion
1.1 Vectors position, velocity and acceleration. Equation of trajectory
1.2 Intrinsic components of acceleration
1.3 Circular motion
1.4 Relative motion

2. Dynamics of a particle
2.1 Fundamental concepts: mass and force
2.2 Newton's laws
2.3 Free body diagrams
2.4 Linear momentum
2.5 Linear momentum conservation
2.6 Momentum of a force and angular momentum

3. Conservative and non-conservative forces. Work and energy
3.1 Escalar and vectorial fields. Gradient and rotational functions
3.2 Work an power
3.3 Kinetic energy
3.4 Conservative forces and potential energy
3.5 Non conservative forces
3.6 Conservation of energy

4. System of particles
4.1 Internal and external forces
4.2 Center of mass and movement of the center of mass
4.3 Kinetic energy of a system of particles
4.4 Conservation theorems

5. Kinematics of the Rigid Body
5.1 Rotation and translation motion
5.2 Motion of the rigid body in the plane
5.3 Moment of inertia
5.4 Theorem of Steiner

6. Dynamics of the Rigid Body
6.1 Equations of motion of the rigid body for translation and rotation
6.2 Rotation work and power
6.3 Kinetic energy of translation and rotation
6.4 Rolling movement

7. Introduction to Thermodynamics
7.1 Thermodynamics: concepts. Ideal gas
7.2 Equilibrium States. Quasistatic processes and reversible processes
7.3 Work
7.4 Temperature definition
7.5 Thermometry. Ideal gas temperature scale
7.6 Thermal coefficients: expansion and isothermal compressibility

8. First principle
8.1 Heat: Heat capacity and specific heat
8.2 Phase Changes: phase diagrams and latent heat
8.3 Internal energy. Internal energy of an ideal gas
8.4 Experiment of Joule. The first law of thermodynamics
8.5 Application of the First Law to ideal gases: quasistatic processes

9. Second principle
9.1 Heat engines; efficiency
9.2 Statement of Kelvin-Planck
9.3 Refrigerators and heat pumps
9.4 Statement of Clausius
9.5 Cycle of Carnot

10. Entropy
10.1 Theorem of Clausius
10.2 Entropy. Reversible process
10.3 Entropy in ideal gases
10.4 Diagrams T-S
10.5 Entropy in irreversible processes
10.6 Second law of the thermodynamics

LEARNING ACTIVITIES AND METHODOLOGY

Lectures on theory, student presentations and personal work; aimed at the acquisition of theoretical knowledge (3 ECTS).
Laboratory practical sessions of compulsory attendance, problem-solving sessions in small groups with direct and active interaction between students and teacher, tutorials and personal work, aimed at the acquisition of practical skills related to the program of the course (3 credits ECTS .)

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

Throughout the course there will be continuous assessment tests. These tests will consist of several exams. They will allow to evaluate the degree of understanding of the different theoretical concepts explained in the lectures. The result of this evaluation will be the 25% of the final grade.

Laboratory practical sessions of the course will be structured in 4 sessions of 1.5 hours. Assistance and

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

preparation of reports for each of the practices is compulsory. The laboratory final grade will be evaluated on the following two aspects of each of the practical sessiones:
a) Student participation. It will be checked by questions made to the students by the teacher after the delivery of each report.
b) Correction of the report prepared for each practical session.

The lab grade will be 15% of the final grade.

It is compulsory to deliver the lab reports in order to pass the course.

There will be a final exam, which may consist of theretical and practical (probloem solving) questions. Its score will represent 60% of the final grade. In order to pass the course, a minimum grade of 3 (out of 10) must be obtained in the final exam.

BASIC BIBLIOGRAPHY

- Alonso-Finn Física, Ed. Addison-Wesley Iberoamericana, 1995

- Beer, Jonston y Cornwell Mecánica Vectorial para Ingenieros. Volumenes Estática y Dinámica., Mc Graw Hill..

- Ohanian, H.C., Markert, J.T. Física para ingeniería y ciencias, McGraw-Hill, 2009

- Tipler, P. A. Física para la ciencia y la tecnología., Ed Reverté , 2005

ADDITIONAL BIBLIOGRAPHY

- Burbano de Ercilla S., Burbano García E. Problemas de Física, Tebar, 2004

- Hewitt, P.G. Física Conceptual, Pearson-Addison Wesley, 2004

- Y. Çengel, M. Boles Termodinámica, Mc Graw Hill, 2006.