Physics I

Academic Year: (2019 / 2020) **Review date: 11/12/2019 09:06:16**

Department assigned to the subject: Physics Department

Coordinating teacher: SANTALLA ARRIBAS, SILVIA NOEMI

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)

Physics and Mathematics at high school level (bachillerato)

OBJECTIVES

By the end of this subject, students will be able to have:
1. Knowledge and understanding of the physics principles underlying their branch of engineering;
2. The ability to apply their knowledge and understanding to identify, formulate and solve mechanics and thermodynamic problems using established methods;
3. The ability to design and conduct appropriate experiments, interpret the data and draw conclusions;
4. The ability to select and use appropriate tools and methods to solve mechanics and thermodynamics problems;
5. The ability to combine theory and practice to solve mechanics and thermodynamic problems;
6. Laboratory skills.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Kinematics of a particle
-Vectors position, velocity and acceleration
-Equation of trajectory
-Intrinsic components of acceleration
-Circular motion

2. Relative motion
-Systems of reference
-Transformations among systems of reference
-Applications

3. Dynamics of a particle
-Fundamental concepts: mass, linear moment and forces
-Newton's laws
-Examples of forces: weight, elastic force, friction...
-Angular moment and moment of forces

4. Conservative and non-conservative forces. Work and energy.
-Scalar and vector fields. Gradient and curl.
-Conservative fields. Potential function.
-Work. Power. Kinetic energy
-Conservative forces and potential energy
-Non-conservative forces.

5. Systems of particles
-Internal and external forces.
-Statics. General condition of equilibrium.
-Motion of the center of masses.

-Kinetic energy of a system of particles.
-Conservation theorems for a system of particles.

6. Kinematics of the Rigid Body
-Rotation and translation motion.
-Motion of the rigid body in the plane.
-Moment of inertia.
-Theorem of Steiner.

7. Dynamics of the Rigid Body
-Equations of motion of the rigid body
-Rotation work and power.
-Kinetic energy of rotation.

8. Introduction to Thermodynamics
-Thermodynamics: concept and definitions.
-Equilibrium States. Quasistatic processes and reversible processes.
-Work.

9. Temperature. Ideal gases
-Definition of temperature
-Thermometry. Ideal gas scale
-Thermal coefficients: expansion and isotherm compressibility

10. First principle
-Experiment of Joule and statement of Helmholtz.
-Internal energy; energy equation of state.
-Heat. Heat capacities and specific heats. Heat and work sources.
-Phase Changes
-Application to ideal gases.
-Diagrams PV and PT

11. Second principle
-Statement of Kelvin-Planck. Thermal engines.
-Statement of Clausius. Refrigerating machines. Irreversibility.
-Cycle of Carnot. Theorem of Carnot. Consequences
-Cycles with ideal gases.

12. Entropy
-Theorem of Clausius. Entropy
-Diagrams T-S. Entropy in ideal gases.
-Entropy in irreversible processes. Entropy balance.

LEARNING ACTIVITIES AND METHODOLOGY

Lectures where the theoretical concepts are explained
The lecturer provide a file with the following information (1 week in advance)
- Main topics to be discussed during the session
- Chapters/sections in each of the text books provided in the bibliography
were the student can read about these topics
Activities in groups (~ 40 students divide in 2-3 people groups) to solve problems
The main skills to be developed in these activities are
- To understand the statement of the problem (for instance drawing an
scheme that summarizes the statement)
- To identify the physical phenomenon involved in the statement and the
physical laws related to it.
- To develop a strategy to reach the objective (for instance breaking the
problem in small sub-problems).
- To be careful in the use of mathematics
- To analyze the result (is the final number reasonable?, are the dimensions
consistent?)
Small works focused to the search of scientific information in different sources (mainly
internet). (PO: a,d)

Laboratoy sessions (~ 24 students divide in 2 people groups)
The main skills to be developed in this activity are:
- To understand that physics is an experimental science and they can reproduce the laws that have been theoretically explained in the lectures
- To use scientific instruments and to be careful in its operation
- To be careful in the acquisition of the experimental data
- To learn the basis of the management of a scientific data set
- To write a report with the main results of the experiment
- To reason in a critical way these results: have we achieve the goals of the

ASSESSMENT SYSTEM

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

Laboratory sessions (15% of final mark)
Attendance to the laboratory sessions and delivery of reports are compulsory.
Evaluation of the reports. The mark is shared by the members of the group.
Activities in groups (25% of final mark)
Attendance.
Short test exams.
Delivery and evaluation of the proposed activities
Written exam (60% of final mark)
This exam is made at the end of the semester and it is the same for all the students
Contents:
- Problems to be solved covering the topics of the program and perhaps
- Short theoretical questions
The grade of this final exam should be higher than 3 (out of 10).

BASIC BIBLIOGRAPHY

- Paul A. Tipler - Gene Mosca Física para la ciencia y la tecnología. Volumen I / Physics for scientists and engineers. V1, Reverté / W.H. Freeman.

- Serway, Raymond A. Física V1 / Physics V1, Thomson.

BASIC ELECTRONIC RESOURCES

- Feynman - Leighton - Sands . The Feynman Lectures on Physics. Volume I: http://www.feynmanlectures.caltech.edu/