Physics I

Academic Year: (2020 / 2021) **Review date: 08-09-2020**

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
- Position, path and displacement. Speed. Acceleration, intrinsic components of acceleration
- Movement composition
- Circular motion
- Reference systems (1)
- Integration of equations of motion without explicit dependence on time

2. Dynamics of a particle
-Fundamental concepts: mass, forces, linear moment
-Newton's laws
-Examples of forces: weight, elastic force, friction...
-Angular moment and moment of forces
-Reference systems (2). Inertial forces

3. 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.

4. 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.

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

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

7. Introduction to Thermodynamics
-Thermodynamics: concept and definitions.
-Equilibrium States. Quasistatic processes and reversible processes.
-Work.
-Gases
-Definition of temperature
-Thermometry. Ideal gas scale
-Thermal coefficients: expansion and isotherm compressibility

8. 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

9. 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.

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

LEARNING ACTIVITIES AND METHODOLOGY

- Theoretical-practical master classes oriented to the acquisition of theoretical knowledge.
- Classes of problems in small groups with active participation of the students.
- Presentations and personal work of the student.
- Practical laboratory sessions of obligatory attendance, oriented to the acquisition of practical skills related to the program of the subject.
- The tutorial regime will be adjusted to the regulations developed by the University.

ASSESSMENT SYSTEM

1) Laboratory sessions (15% of final grade).
- Attendance to the laboratory sessions is compulsory, as well as the completion of the report requested for each session.
- Laboratory reports will be graded as well as the participation and attitude in the laboratory sessions.

2) Assessment during the course (25% of final grade).
- Midterm exams.
- Delivery and evaluation of any assigned homework.

3) Final exam (60% of final grade)
The exam is made at the end of the semester and it is the same for all the students.

Minimal grade in written exam to pass the course: 3.0. This requirement is independent of what the final grade might be once the different aggregate contributions are added.

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

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.
- Raymond A. Serway John W Jewett Física / Physics, Paraninfo / Thomson .

ADDITIONAL BIBLIOGRAPHY

- David Halliday, Robert Resnick, Jearl Walker Fundamentals of physics, John Wiley and Sons.

- Douglas C. Giancoli Física : principios con aplicaciones / Physics : principles with applications, Prentice-Hall Hispanoamericana / Pearson Education International .

- Francis W Sears, Mark Waldo Zemansky, Hugh D Young, Roger A Freedman Física universitaria / University Physics, Pearson.

- Marcelo Alonso, Edward J Finn Física, Pearson Educación.

- Paul G. Hewitt Física conceptual, Addison-Wesley Iberoamericana.

BASIC ELECTRONIC RESOURCES

- University of Colorado . Phet interactive simulation: https://phet.colorado.edu/es/simulations/category/physics

- Walter Fendt . Apps on Physics: https://www.walter-fendt.de/html5/phes/