Physics I

Academic Year: (2020 / 2021) **Review date: 11-09-2020**

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

OBJECTIVES

Upon successful completion of this subjec, the studients will be able to:

1. Have knowledge and unserstanding of the physical principles related with mechanics and t3. hermodynamics.
2. Have the ability to apply their knowledge and understanding to identify, formulate and solve problems related to mechanics and thermodynamics using established methods.
3. Have the ability to design and carry out mechanics and thermodynamics experiments, analyze the data and draw conclusions.
4. Handling laboratory instruments for data collection in experiments related to mechanics and thermodynamics laboratory sessions.
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 I
2.1 Fundamental concepts: mass and force
2.2 Newton's laws
2.3 Free body diagrams

3. Dynamics of a particle II
3.1 Linear momentum
3.2 Linear momentum conservation
3.3 Momentum of a force and angular momentum

4. Conservative and non-conservative forces. Work and energy
4.1 Escalar and vectorial fields. Gradient and rotational functions
4.2 Work an power
4.3 Kinetic energy
4.4 Conservative forces and potential energy
4.5 Non conservative forces
4.6 Conservation of energy

5. Systems of particles
5.1 Internal and external forces
5.2 Center of mass and movement of the center of mass
5.3 Kinetic energy of a system of particles
5.4 Conservation theorems

6. Kinematics of the Rigid Body
6.1 Rotation and translation motion

6.2 Motion of the rigid body in the plane
6.3 Moment of inertia
6.4 Theorem of Steiner

7. Dynamics of the Rigid Body
7.1 Equations of motion of the rigid body for translation and rotation
7.2 Rotation work and power
7.3 Kinetic energy of translation and rotation
7.4 Rolling movement

8. Introduction to Thermodynamics
8.1 Thermodynamics: concepts. Ideal gas
8.2 Equilibrium States. Quasistatic processes and reversible processes
8.3 Work
8.4 Temperature definition
8.5 Thermometry. Ideal gas temperature scale
8.6 Thermal coefficients: expansion and isothermal compressibility

9. First principle
9.1 Heat: Heat capacity and specific heat
9.2 Phase Changes: phase diagrams and latent heat
9.3 Internal energy. Internal energy of an ideal gas
9.4 Experiment of Joule. The first law of thermodynamics
9.5 Application of the First Law to ideal gases: quasistatic processes

10. Second principle
10.1 Heat engines; efficiency
10.2 Statement of Kelvin-Planck
10.3 Refrigerators and heat pumps
10.4 Statement of Clausius
10.5 Cycle of Carnot

11. Entropy
11.1 Theorem of Clausius
11.2 Entropy. Reversible process
11.3 Entropy in ideal gases
11.4 Diagrams T-S
11.5 Entropy in irreversible processes
11.6 Second law of the thermodynamics

LEARNING ACTIVITIES AND METHODOLOGY

- Lectures on the specific topics. Provide a theoretical background on physics. They will be imparted by face-to face online sessions.
- Recitation classes for solving assigned problems and discussion of specific concepts previously addressed.
- Practical laboratoy sessions. Students must carry out experimental measurements and analyse the results
- Office hours

ASSESSMENT SYSTEM

- Laboratory sessions (15% of final mark)
Attendance to the laboratory sessions is compulsory.
Evaluation of the reports.
- Recitation classes (25% of final mark)
A regular evaluative process is conducted through short exams and activities. This process accounts for 25% of the final mark.
- Final exam (60% of final mark)
This exam is made at the end of the semester.
For the final mark, a minimum score of 3 out of 10 in the final exam is required to take into account the continuous evaluation mark.

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

BASIC BIBLIOGRAPHY

- Bedford, Fowler Mechanics for engineering, Addison Wesley..
- Beer, Johnston y Cornwell Vector Mechanics for Engineers. , Mc Graw Hill. .
- Paul Tipler Physics for the science and the technology. , Ed. reverté 2005.
- Sears, Zemansky, Young, Freedman University Physics, Wesley .
- Serway, Raymond A. Physics: for sciences and engineering. , Thomson 2005.

ADDITIONAL BIBLIOGRAPHY

- Hewitt, P.G.. Conceptual Physics, Alhambra Mexicana, 2000
- Y. Çengel, M. Boles. Thermodynamics, Mc Graw Hill, 2006