# Physics I

**Academic Year: ( 2023 / 2024 )** **Review date: 27-04-2023**

**Department assigned to the subject: Physics Department**

**Coordinating teacher: SAVOINI CARDIEL, BEGOÑA**

**Type: Basic Core ECTS Credits : 6.0**

**Year : 1 Semester : 1**

**Branch of knowledge: Engineering and Architecture**

## 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

Continuous assessment (40% of final mark):

- Laboratory sessions (15% of final mark)
Mark will be will be calculated on the basis of participation in the sessions and the grading of the reports.
Attendance to the laboratory sessions is compulsory.

- Short exams (25% of final mark)
A regular evaluative process is conducted through short exams and activities.

End of term examination (40% of final mark):

This exam is made at the end of the semester. A minimum score of 3 out of 10 in this final exam is required.

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| **% 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