FISICA I A - E

FIS/01 - 9 CFU - 2° Semester

Teaching Staff

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LEARNING OBJECTIVES

The student is required to achieve the following training objectives:

- physical quantities and dimensional analysis;
- vector calculation and applications;
- static and dynamic of the material point and of the rigid body;
- fluidostatic and fluid dynamics;
- thermodynamics

COURSE STRUCTURE

The teaching method is generally the most congenial to the teaching of Physics 1. In particular, in addition to the classical lecture with the use of a standard blackboard, slides will be used to deepen some specific topics. In addition, multimedia files (video and / or audio) will be used to facilitate the understanding of some topics. In addition to this, teaching in cooperative learning is privileged, in which the classroom becomes a moment of development and apprehension of knowledge. Brainstorming will also be considered (mainly for the resolution of exercises submitted by the teacher) and flipped-classroom in which the students will be directly called into question to explain or illustrate exercises or theoretical topics. The verification method includes self-assessment tests during the entire second semester as well as exam tests with cross-section exercises on the course topics.

DETAILED COURSE CONTENT

1) Physics quantities

Quantities in physics--International system-Dimensions and dimensional calculation-Measurement uncertainties

2) Vectors

Reference frame and euclidean axes; Geometrical meaning of vectors; Vectors in physics and their role in describing 2D and 3D space; Vector and scalar quantities; Vectors in the plane and their decomposition; Versors; Operation with vectors: sum, difference product

3) Kinematics

Position and displacement vector; Velocity and accelerations vectors; ; One dimensional motion with constant velocity; One dimensional motion with constant acceleration; Freely falling objects; Projectile motion; Uniform Circular motion; Centripetal acceleration

4) Dinamics

The concept of force; Newton's laws of motion; The force as a vector; Gravitational force; Forces of friction; The concept of work; Equilibrium condition and the inclined plane (with and without friction forces); Work done by a constant and a varying force; Conservative forces; Elastic forces and Hooke's law; The simple pendulum; Mass-spring system; Kinetic Energy and the wrok-kinetic energy theorem: Gravitaional force and gravitaional law; Conservation of energy; Potential energy; The isolated systems: conservation of mechanical energy; System of particles; Center-of-mass and its coordinates; Linear momentum and its conservation; Impulse and momentum; One dimenaional collisioons; Angular position, veolicity and acceleration; Rotational kinematics; Rigid body; Angular momentum and torque; Energy in rotational motion; Angular momentum conservation; Rolling motion of a rigid body: Introduction to oscillation and similarities between pendulum and spring-mass system

5) Fluid mechanics

Pressure; Variation of pressure with depth; Stevin's law; Pressure measurements; Pascal's law; Buoyant forces and Archimede's principle; Fluid dynamics; Bernoulli's equation

6) Thermodinamics

Temperature and the zeroth law of thermodynamics; Thermic contact; Thermometers; Absolute scale of temperatures; Thermic equilibrium; The heat; Thermal expansion of solids and liquids; Specific heat and calorimetry; Temperature of equiibrium; Latenet heat; The first law of thermodynamics; Work, heat and internal energy in thermodynamics; Transformation; Peferct gases; Transformations with constant temperature or volume or pressure; Molar specifi heat; The Mayer relation; Adiabatic transformations; The Carnot Cycle; The Carnot principle; The second law of thermodynamics; Entropy; Third law of thermodynamics

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TEXTBOOK INFORMATION

1. P. Mazzoldi, M. Nigro, C. Voci "Fisica, Volume I" (II edizione), Edises
2. D. Halliday, R. Resnick, J. Walker "Fondamenti di Fisica" (2015) Casa Ed. Ambrosiana;
3. D. Roller, R. Blum "Fisica (Vol. I)" Casa Ed. Zanichelli
4. Serway, Jewett "Principi di Fisica" (2015) Edises
5. D. Halliday, R. Resnick, J. Walker "Fundamental of Physics" Casa Ed. Ambrosiana;