Course Unit	Physics	**Field of study**	Physics
Bachelor in	Electrical and Computers Engineering	**School**	School of Technology and Management
Academic Year	2021/2022	**Year of study**	1	**Level**	1-1	**ECTS credits**	6.0
Type	Semestral	**Semester**	2	**Code**	9112-742-1204-00-21

Workload (hours)	162	**Contact hours**	T	30	TP	30	PL	-	TC	-	S	-	E	-	OT	-	O	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) João Carlos Almendra Roque, Manuel Teixeira Brás César

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Know and understand basic physical processes and phenomena.
2. Acquire knowledge need to read physics literature and work with physical quantities, units and tables.
3. Solve physics problems by applying vectors operations and equations governing kinematics (rectilinear and curvilinear including circular motion).
4. Know and identify typologies of fundamental forces: weight, normal reaction, tension and compresssion, elastic, friction.
5. Solve physics problems by applying Newton's Laws, principle of work and energy, conservation of mechanical energy, impulse and momentum theorem, conservation of momentum.
6. Know, understand and to solve problems of periodic (oscillatory and wave) motion.

Prerequisites

Before the course unit the learner is expected to be able to:
Solve basic problems of mathematics and physics.

Course contents

Physical quantities and units. Mathematical operations with vectors. Kinematics. Statics and Dynamics: Newton's Laws. Work and Energy. Impulse and Momentum. Oscillatory and wave motion.

Course contents (extended version)

1. Physical quantities and units.
    - Physical quantities, units and measures.
    - International System of Units and other systems. Conversion of units.
    - Fundamental units and derived units.
    - Dimensional analysis.
    - Scalar and vector quantities.
    - Applications with vector calculus.
2. Kinematics.
    - Rectilinear, curvilinear and circular motion.
    - Position, displacement, velocity and acceleration vectors.
    - Uniform and non-uniform motion.
    - Motions with constant acceleration: accelerated and retarded motions.
    - Curvilinear motion. Tangential and normal acceleration components
    - Circular motion. Angular velocity and angular acceleration. Period and frequency.
    - Relative motions. Relative displacement, velocity and acceleration.
    - Motion of projectiles
3. Statics / Dynamics.
    - Newton's laws.
    - Types of forces.
    - Free-body diagrams.
    - Static / dynamic equilibrium of a particle. Equations of equilibrium.
    - Static equilibrium of a body. Moment of a force.
    - Friction. Applications in static and dynamic problems.
4. Work and energy.
    - Work a constant force.
    - Work a variable force.
    - Kinetic energy and potential energy.
    - Power and efficiency.
    - Conservative and nonconservative forces.
    - Principle of work and energy.
    - Conservation of mechanical energy.
5. Impulse and momentum.
    - Linear impulse and linear momentum.
    - Linear impulse and momentum theorem.
    - Angular impulse and momentum.
    - Angular impulse and momentum theorem.
    - Conservation of linear and angular momentum.
    - Collisions.
6. Oscillation and waves.
    - Oscillatory and wave motion.
    - Simple harmonic motion.
    - The pendulum.
    - Damped and forced oscillations.
    - Wave equation.
    - Transverse and longitudinal waves.
    - Sound waves.

Recommended reading

1. Halliday, Resnick, Walker, "Fundamentos de Física 1", 4ª ed, LTC editora, 1996.
2. Halliday, Resnick, Krane, "Física 1", 4ª ed, LTC editora, 1996.
3. Halliday, Resnick; Krane . "Física 2", 4ª ed, LTC editora, 1996
4. Beer, Russel, "Mecânica vectorial para engenheiros : cinemática e dinâmica", 5ª ed, Makron Books , 1994
5. Tipler, Mosca, "Física para cientistas e engenheiros", 5th ed, LTC , cop. 2006

Teaching and learning methods

In the lectures classes are presented the fundamental concepts for understanding the course contents. The students, helped by the teacher, enhance their knowledge by solving a group of practical exercises. These, and some other exercises, will then be discussed and solved in the problem-solving, project or laboratory classes.

Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final)
    - Intermediate Written Test - 50%
    - Final Written Exam - 50%
2. Alternative 2 - (Regular, Student Worker) (Final, Supplementary, Special)
    - Final Written Exam - 100%

Language of instruction

Portuguese

Electronic validation

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08-03-2022	11-03-2022	21-03-2022	22-03-2022