

DIM-GITI-103 Physics

SEMESTER: Annual (Fall and Spring)
CREDITS: 12 ECTS (4 hrs. per week)
LANGUAGE: Spanish
DEGREES: GITI

Course overview

This annual course introduces students to classical mechanics, electricity and magnetism and thermodynamics.

Prerequisites

Basic knowledge of calculus.

Course contents

1. Kinematics of the particle. Motion in one dimension. Integration of time dependent, position dependent and speed dependent accelerations. Motion in two dimensions. Normal acceleration and tangential acceleration. Relative translational kinematics.
2. Dynamics of the particle in the plane. Inertial systems and principle of inertia. Forces. Principle of action and reaction. Newton's second law. Mass and weight. Linear momentum. Friction.
3. Work and Energy. Work. Kinetic energy. The Work-Kinetic-Energy Theorem. Conservative forces. Potential energy. Theorem of work and energy. Elastic potential energy. Gravitational potential energy. The conservation of mechanical energy. Simple harmonic motion. Power. The conservation of energy.
4. Particle Systems. Center of mass. Conservation of linear momentum. Kinetic energy of a system. Collisions. Continuously varying mass systems: rocket propulsion. Center of mass reference frame.
5. Plane motion of rigid bodies. Rotation about a fixed axis. Angular velocity and angular acceleration. General plane movement. Distribution of velocities and accelerations. Instant center of rotation. Torque about an axis. Moment of inertia. Newton's second law for rotation. Rolling objects. Translational and rotational kinetic energy.

6. Angular Momentum. Angular Momentum of a particle. Central forces. Angular momentum of the rigid body. Conservation of angular momentum.
7. Electrostatic. Electric charge. Coulomb's law. Electric Field. Gauss Law. Electric potential. Electrical conductors. Electrostatic energy.
8. Electric current. Current density. Ohm's Law. Joule effect. Electromotive force.
9. Magnetostatics. Magnetic field. The force exerted by a magnetic field on particles and currents. The magnetic field of currents: Biot-Savart law. Ampere's law.
10. Electromagnetic Induction. Faraday's law. Lenz's Law. Self-inductance. Mutual inductance. Magnetic energy.
11. Ampere-Maxwell law. Electromagnetic radiation. Energy of a wave. Electromagnetic spectrum.
12. Thermodynamics. Thermal equilibrium and temperature. Scales. Perfect gases. Phase changes. First principle. Thermal machines. Second principle. Carnot cycle.

Textbook

- Paul A. Tipler - Gene Mosca, Física para la Ciencia y la Tecnología, sixth Edition, Reverté, 2010.

Grading

The final grade for this course is based on the following criteria:

- Two end of term exams (25% each)
- Two midterm exams (15% each)
- Four short exams (5% each)

The following conditions must be accomplished to pass the course:

- A minimum overall grade of at least 5 over 10.
- A minimum grade of 4 over 10 in the end of term exams.