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# Physics AB

## Programma

1. Introduction, physical quantities, their measure and uncertainties.
2. The case of a point mass. Kinematics: motion in one, two and three dimensions, relative motion. Dynamics: mass, force, Newton laws. Weight, friction. Circular motion. Fictitious forces.
3. Gravity, point mass and spherical mass, Kepler law of areas.
4. Work and energy, scalar product, Hooke force, kinetic and potential energy, virtual works, stable and unstable equilibrium, conservation of energy, central forces, gravitational potential energy, binding energy.
5. Systems of masses. center of mass, center of mass motion, linear momentum, conservation of linear momentum, impulse, elastic collision in one dimension, totally anelastic collision.
6. Mechanics of the rigid body (introduction): vector product, angular momentum and torque, work under rotations, the theorem of angular momentum, conservation of angular momentum, kinematics of a rigid body, moment of inertia, cardinal equation of dynamics, static equilibrium, kinetic energy, rolling without slip, center of mass reference frame, Atwood machine, precession and the gyroscope.
7. Electric field: introduction, Coulomb's law, the field concept, Gauss' law, the field of simple charge distributions
8. Electrostatic potential: potential energy and work, potential around simple charge distributions
9. Electric fields inside matter: conductors and insulators, dipoles, capacitors.
10. Electric currents: current density, conservation of charge, Ohm's law, Kirchhoff's laws and their physical bases, Joule's effect, discharge of a capacitor.
11. Capacitance. Electric field energy. Capacitance. Dielectric constant. Capacitors in combination. RC circuits. Time constants.
12. Magnetic field. The nature of magnetism. Magnetic field. Magnetic field of a current. Force on a moving charge. The mass spectrometer. Force on a current. Force between two currents. Torque on a current loop. Magnetic poles.
13. Electromagnetic induction. Electromagnetic induction. Moving wire in a magnetic field. Faraday's law. Back emf. The transformer. Magnetic field energy. Inductance. Self induced emf. Electrical oscillations.

## Modalità d'esame

Two written test during the term with problems and questions similar to those solved during the tutored sessions.

Minimum of 18/30 for each of the two tests to pass the exam directly.

The oral exam is optional in this case, to improve the grade.

The oral exam is divided in two parts, like the course. If a student has average grade in excess of 18/30, but still one or two failed tests the oral is compulsory for the parts corresponding to the failed tests. An average grade of 17/30 implies that the student must take the oral exam on all two parts.

## Propedeuticità

Calculus (Analisi) AB

## Testi consigliati

-D.Halliday,R.Resnick and J.Walker, Fondamenti di fisica vol 1. e 2., Casa editrice Ambrosiana.

-R.A. Serway and R.J. Beichner, Fisica vol. 1 e 2, Edises.