



PHYSICS A - L

FIS/07 - 6 CFU - 2° Semester

Teaching Staff

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DETAILED COURSE CONTENT

1) Measurements and uncertainties

Models, theories, laws-Measurements and uncertainties-Units of measurements, samples and the International systems of measures-Conversions of the measurement units-Dimensionality calculus

2) Motion description: kinematics in one dimension

Systems of reference and displacement-Mean velocity-Instantaneous velocity-Acceleration-Motion with constant acceleration-Falling objects-Graphical analyses of the linear motion

3) Kinematics in two dimensions; Vectors

Vectors and scalars-Sum of vectors: graphic method-Subtraction of vectors and multiplication of vector with a scalar-Sum of vectors by components-Bullet motion-Relative velocity

4) Motion and forces: dynamics

Force-Newton's first law-Mass-Newton's second law-Newton's third law-Weight: the gravitational force and the normal force-Applications involving friction: inclined plans

5) Circular motion; Gravitation

Kinematics of the uniform circular motion-Dynamics of the uniform circular motion-Newton's law of the gravitation-Gravitation near the Earth surface-Kepler's laws

6) Work and energy

Work by a constant force-Work by a non-constant force-Kinetic energy and the work principle-Potential energy-Conservative and non-conservative forces-Conservation of the mechanical energy-Other types of energy: energy transformation and the energy conservation principle-Energy conservation principle

involving friction

7) Impulse

Relation impulse-force-Impulse conservation-Collisions and impulse-energy and impulse conservation in collisions-Elastic collisions in one dimension-Inelastic collisions-Collisions in two and three dimensions-Center of mass

8) Rotatory motion

Angular quantities-Kinematic equations for the uniform accelerate rotatory motion-Rolling motion-Torque-Rotational dynamics: torque and inertial moment-Rotationale kinetic energy-Conservation of the angular momentum-Vectorial nature of the angular quantities

9) Static; Elasticity

Static: equilibrium between forces-Equilibrium conditions-Elasticity: Hooke's law

10) Fluids

Density-Pression-Atmospheric and relative pression-Pascal principle-Pression measurements: manometer and barometer-Archimede's principle-Motion of fluids: flow and continuity equation- Bernoulli equation-Application of the Bernoulli principle

11) Vibrations and waves

Armonic motion-Energy in the armonic oscillator-Period and sinusoidal nature of the armonic motion-Pendulum-Damped armonic motion-Forced vibrations; resonance-Undulatory motion-Transversal and longitudinal waves-Energy carried by waves-Waves reflection and interference-Stationary waves; resonance

12) Sound

Properties of the sound-Sound intensity: decibel-Sound sorces: vibrating strings and air columns- Sound waves interference-Doppler effect

13) Temperature and kinetic theory

Atomic theory of matter-Temperature and thermometers-Thermic equilibrium and zero principle of the thermodynamic-Thermic dilatation-Anomalous water behaviour under 4 °C-Gases laws and absolute temperature-Ideal gas law-Ideal gas law and the molecules: the Avogadro number-Kinetic theory and the molecular interpretation of the temperature-Distribution of the molecular velocities-Real gases and phase transformation-Vapour tension

14) Heat

Heat and energy transfer-Distinction between temperature, heat, and internal energy-Internal energy of an ideal gas-Specific heat and calorimetry-latent heat-Heat transmission: conduction, convection, irradiation

15) Principles of the thermodynamics

Thermodynamic's first principle-Applications of the first principle-Thermodynamic's second principlea-Thermic machines-Entropy and the second principle-From order to disorder;unavailable energy-Statistic

interpretation of the entropy

16) Electric charge and field

Static electricity; conservation of the electric charge-The electric charge in the atom-Dielectrics and conductors-The induced charge; the electroscope-Coulomb law-electric field-Field lines-Electric fields and conductors

17) Electrical potential and energy; capacitance

Electric potential and differences of potential-Relation between electrical potential and field-equipotential lines-Electronvolt as measurement unit for the energy-Electrical potential due to pointiform charges-Electrical dipoles-Capacitance-Dielectrics-Charge storage

18) Electrical currents

The battery-The current-Ohm's law: the resistance-Resistivity-Electrical power-AC current- Microscopic aspects of the electrical current

19) DC circuits

Parallels and series of resistances-Electromotive force-Kirchhoff's laws-Parallels and series of Electromotive; Charging a battery-Circuits with parallels or series of capacitances-Circuits with a resistance and a capacitance-DC Ammeters and Amperometric voltmeters

20) Magnetism

Magnets and magnetic fields-electric currents as sources of magnetic fields-Force applied by a magnetic field on an electric current; Definition of B-Force applied by a magnetic field on a electric charge in motion-Magnetic field by a linear thread-Force between parallel threads-Ampere and Coulomb unit measurements definitions-Ampere's law-Torque on a coil travelled by a current; magnetic torque-Applications: galvanometers, motors-Mass spectrometer-Ferromagnetism-Electromagnets e solenoids-magnetic fields in matter; hysteresis

21) Electromagnetic induction and the Faraday's law; AC circuits

Induced electromotive force-Faraday's law;Lenz's law- Induced electromotive force in a conductor in motion-Relation between the variation of the magnetic flux and the electrical field-Electric generators-Parasitical currents-Transformators; electric energy transfer-Inductance-Energy in a magnetic field-LR circuits-AC circuits; impedance-AC RLC circuits-Resonance in AC circuits; oscillators

22) Electromagnetic waves

Relation between variable electric fields and magnetic fields: Maxwell equations- Fourth Maxwell's equation; the displacement current-Electromagnetic waves production-Calculus of the velocity of the electromagnetic waves-Light as an electromagnetic wave; the electromagnetic spectrum-Measurement of the light velocity-Electromagnetic waves energy

23) The light: geometric optics

The light modeled as beams-Reflection; images formation on a plane mirror-Images formation on spherical mirrors-Refractive index-Refraction: Snell's law-Internal total reflection-Thin lens; rays diagrams-The lens equation

24) Waves nature of the light

Huygens principle and diffraction-Huygens principle and refraction; Interference; Young experiments-Visible spectrum and dispersion-Diffraction from a split-Diffractive grating-The spectrometer and the spectroscopy-Polarization

25) Optical instruments

The human eyes-Magnifying lens-Telescope-Microscope-Lens and mirrors aberrations-Resolution limits: Rayleigh criterion-Telescope and microscope resolution-Diffraction of X rays

TEXTBOOK INFORMATION

Theory:

- 1) Raymond A. Serway, John W. Jewett, "Principi di Fisica (quinta edizione)", EDISES
- 2) Douglas C. Giancoli, "Fisica-Principi e Applicazioni" (Edizione italiana a cura di Paolo Cavatorta e Lanfranco Cicala), edizioni "Casa Editrice Ambrosiana"
- 3) F. Borsa, A. Lascialfari, "Principi di Fisica-per indirizzo biomedico e farmaceutico", EDISES

Exercises:

- 1) John R. Gordon, Ralph W. McGrew, Raymond R. Serway, John W. Jewett, "Esercizi di Fisica-guida ragionata alla soluzione", EDISES
 - 2) http://upload.wikimedia.org/wikibooks/it/4/4b/Esercizi_di_fisica_con_soluzioni.pdf;
<http://www60.jimdo.com/app/s80e7ac8b55e77c3c/p6a5b5a2aca6b274c/>
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