
Physics C

Finalità

The aim is to supply basic notions about thermology, thermodynamics, gas properties, mechanical and electromagnetic waves, geometric and wave optics.

Programma

Thermology and ideal gas

Temperature: scales and thermometers. Equation of state for an ideal gas. Real gases. Interpretation of pressure and temperature in the framework of the ideal gas kinetic theory. Principle of energy equipartition. Molecular velocity distribution. Molecule mean free path.

Heat and First Law of thermodynamics

Heat. Heat capacity and specific heats. Work in thermodynamic processes. First Law of thermodynamics. Thermodynamic transformations and cycles in an ideal gas. Specific heats of an ideal gas. Isothermal and adiabatic processes in an ideal gas.

Entropy and Second Law of thermodynamics

Reversible and irreversible processes. Entropy. Second Law of thermodynamics. Carnot cycle. Statistical interpretation of entropy. Thermodynamic potentials.

General properties of wave motion and mechanical waves

Wave function and wave equation. Phase and group velocity. Longitudinal and transverse waves. Harmonic waves. Superposition principle. Interference of harmonic waves. Steady waves. Wave propagation in elastic media. Sound waves. Wave energy and intensity.

Electromagnetic waves

From the Maxwell's equations to the electromagnetic wave equation. Propagation velocity. Electromagnetic spectrum. Energy. Poynting vector. Electric dipole radiation. Polarised waves.

Light

Huygens' principle. Light rays. Reflection and refraction laws. Light dispersion. Prisms. Total internal reflection. Optical fibres.

Geometric Optics

Mirrors. Spherical diopters. Thin lenses. Lens aberrations. Centred paraxial optical systems.

Wave optics and polarisation

Interference from slits and thin films. Michelson interferometer. Fraunhofer diffraction. Diffraction grating. Dispersion and resolving power. Light polarisation. Polarisation by reflection and selective absorption.

Attività d'esercitazione

Guided exercise solution in classroom will be routinely performed. Simple Wave Optics experiments.

Modalità d'esame

The recommended exam modality is to undertake the planned mid-term written test covering Thermodynamics and Mechanical Waves during the teaching period. Alternatively, a single written test covering the whole course program must be passed in any of the scheduled official exam dates. Such a written test will cover only Electromagnetic waves and Optics for students who have passed the mid-term written test. Written tests include both theory questions and exercises. The written test is followed by a verbal one.

Propedeuticità

Mathematics. Calculus. General Physics A-B.

Testi consigliati

D. Halliday, R. Resnick, J. Walker, Fondamenti di Fisica (vol. unico), Casa Editrice Ambrosiana (english version available).

R. A. Serway, Principi di Fisica (vol. unico), ediSES (english version available).

R. Capelletti, Lecture notes.