



FISICA M - Z

FIS/07 - 9 CFU - 2° Semester

Teaching Staff

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LEARNING OBJECTIVES

The provided knowledge enables the student to face the most specific courses of the study plan; a particular importance is given to the contribution of physics in its biomedical field applications included in the program. At the end of the course, the student will have learned the experimental method fundamental elements, the basic laws of physics and their different applications to the fields concerning the study plan. The formal correctness in the exposition of the treated subjects is particularly taken into account with regards to mathematical knowledge acquired from the student in his previous courses. The goal is the achievement of the following training objectives: - a knowledge and a capacity comprehension on physics foundations - practical competencies concerning methodological and instrumental procedures also useful in biological field research.

COURSE STRUCTURE

Lectures and examples of application on specific topics are planned. The lectures will focus on methodological content of the discipline for some topics covered in the course and application contents for the majority of topics covered. The students will actively deepen the applicative contents during some lessons that will take place in the Physics Laboratory of the Department of Physics and Astronomy.

DETAILED COURSE CONTENT

General Physics

INTRODUCTION: Physical quantities, units of measurement, significant figures, measurement error, scalar quantities and vector quantities, operations with the vectors, components of a vector and versors.

MOTOR DESCRIPTION: Displacement, speed and acceleration vectors, motion with constant speed,

motion with constant acceleration, motion in two dimensions.

STRENGTH AND MOTION: I, II and III Newton's law, gravitational force, motion of a projectile, friction forces, dynamics of circular motion; motion of a sphere in a liquid.

ENERGY AND WORK: Work carried out by a variable force, kinetic energy and the theorem of kinetic energy, conservative forces, potential energy, conservation of mechanical energy.

MECHANICAL WAVES AND SOUND: Harmonic motion, propagation of an impulse and a wave, acoustic waves and sound, decibels.

FLUIDS: Fluid pressure, Stevino's law, Archimedes's principle, Bernoulli's theorem, laminar motion of a viscous fluid: Stokes's law, Poiseuille's law, surface phenomena: Laplace's law, surface tension and phenomena of capillarity.

TEMPERATURE, HEAT AND PRINCIPLES OF THERMODYNAMICS: Thermometers and temperature scales, thermal expansion of solids and liquids, perfect gas law, kinetic gas theory, specific heat, latent heat and phase changes, heat conduction, thermodynamic transformations, working in thermodynamic transformations, internal energy, the first principle of thermodynamics.

ELECTRICAL CHARGE, FIELD AND ELECTROSTATIC POTENTIAL: The electric charge, conductors and insulators, the Coulomb's Law, the electrostatic field, lines of force, potential and electrostatic potential energy, the electrostatic capacity.

ELECTRICAL CURRENT: the electric current, resistance and Ohm's law, superconductors, model for electrical conduction, energy and electric power.

MAGNETIC FIELDS: Motion of a charged particle in a magnetic field, magnetic force on a current-carrying conductor, magnetic field produced by a current, Biot-Savart law, Faraday's law and induction, energy density in a magnetic field.

ELECTROMAGNETIC WAVES: electromagnetic waves, the energy carried by electromagnetic waves, the spectrum of electromagnetic waves.

GEOMETRIC OPTICS: reflection, refraction and light dispersion, total reflection, optical fibers, lenses and image formations

Biomedical physics

ELASTIC WAVES: Application of ultrasounds

FLUID MECHANICS: Hydrodynamic blood circuit, work and cardiac output. Aneurysm and stenosis, gaseous embolism. Erythrocyte sedimentation rate, centrifugation.

ELECTRIC PHENOMENA: The propagation of nerve impulses in myelinated and unmyelinated fibers.

ELECTROMAGNETIC AND RADIATION WAVES: Vision optics. the magnifying glass and the optical microscope, the electromagnetic fields and the effects on human health

TEXTBOOK INFORMATION

Raymond A. Serway and John W. Jewett, Jr.- Principles of Physics: A Calculus - Based Text -5th Edition, International Edition - Copyright © 2013 Brooks/Cole, Cengage Learning

D. Halliday, R. Resnick, J. Walker - Fundamentals of Physics Vol 1 and 2 -
