UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biophysics

1920-1-H4101D252-H4101D019M

Aims

PHYSICS: Physics of radiation and biological effects of radiation.

Biomechanics: Statics of the rigid body with applications to the human body.

Thermodynamics: 1st and 2nd principles of thermodynamics and entropy.

Electrostatics and electrodynamics: Electrical charges and electrical circuits.

Fluid mechanics: ideal fluids and real fluids

Optics: mechanism of the human visual system.

Contents

The primary goal of the course is to provide students with the tools for the understanding of the complex reactions that represent the molecular basis of life, and with the fundamentals to identify the cause-effect relations of the most important chemical and physical processes for the curriculum and the work of a physician. This knowledge will form the primary basis for a rationale approach to the knowledge of medical sciences.

Detailed program

RADIATION PHYSICS: - Overview of the physics of the nucleus. - Radioactive decay. - Alpha, beta, gamma and nuclear reactions decay. - Emission and absorption of corpuscular and electromagnetic radiation . - X-ray. - Radiation-matter interaction. - Biological effects of radiation

BIOMECHANICS - Moment of a force. - Balance of a body with exemplifications of Human Body. - Levers. - Mechanics of locomotion. - Statics of the body. - Young's modulus and elasticity. - Compression module. - Deflections, twists, fractures.

THERMODYNAMICS: - Systems and thermodynamics states - Phase transitions - Perfect gas transformations - 1st principle of thermodynamics - 2nd principle of thermodynamics and entropy - Enthalpy and free energy.

ELECTRODINAMICS: - Interaction between electric charges. - Electrical field and electrostatic potential. - Distribution of electric charges: electric dipole and dipole layer. -Meaning of the dielectric constant. - The capacity of a capacitor. - Electrical circuits. - Laws of Ohm. - Concept of stationary current and of transient current. - Charge and discharge of a capacitor.

MECHANICS OF FLUIDS: - Stevino's Law - Principle of Archimedes - Theorem of Bernoulli – Poiseuille equation. Properties of real liquids and viscosity- Concept of hydraulic resistance . - Surface tension in liquids. - Surfactants; phenomena of adhesion and capillarity. - Laplace law

OPTICS: - Spectrum of electromagnetic radiation. - Absorption of the radiation - Light and image formation - Lenses and geometrical optics - Construction of images according to geometrical optics - Eye as an optical system - Optical defects of the eye - Theory of the color perception

Prerequisites

Basic knowledges of mathematics and analysis.

Teaching form

Lectures and exercises

Textbook and teaching resource

FISICA MEDICA: F. Borsa, A. Lascialfari, "Fisica Medica", Ed. Edises

Semester

First semester

Assessment method

PHYSICS Written exam with questions and exercises with open answers (numerical exercises which require the application of some physical principle). Oral exam on evaluation of professors.

Office hours

By telephone appointment (02 6448 8209) or by email (francesco.mantegazza@unimib.it).