



CHIMICA E FISICA

8 CFU - 1° Semester

Teaching Staff

DANIELE TIBULLO - Module Chemistry - BIO/10 - 4 CFU

GIULIO MANICO' - Module Physics and Biomechanics - FIS/07 - 4 CFU

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Office Hours: Lunedì dalle ore 15:00 alle 17:00 e Martedì dalle ore 15:00 alle 17:00. E' gradita una email di prenotazione al fine di ottimizzare il servizio per gli studenti.

LEARNING OBJECTIVES

▪ Chemistry

The course provides the basic of the chemistry and describes structures and functions of molecules in living cells.

▪ Physics and Biomechanics

The purpose of the Physics module is to teach basic physics and mathematics with simple applications to biomedical problems. The homogeneity of the preparation for all students is to be obtained in view of the specific knowledge required in the continuation of the Degree Course. In particular, the student must acquire knowledge of some basic laws and physical techniques for the understanding of physiological, biological and medical processes and will have to learn basic concepts useful for the correct use of the instrumentation used in the professional field.

COURSE STRUCTURE

▪ Chemistry

Traditional lectures, with the support of slides and audiovisual tools. At the end of the lecture, ample space is given to the comment on the discussed topics.

▪ Physics and Biomechanics

Traditional lectures, with the support of slides and audiovisual tools. At the end of the lecture, ample space is given to the comment on the discussed topics.

DETAILED COURSE CONTENT

▪ Chemistry

- Atom: structure of the atom
- Elements and the Periodic Table
- Chemical bonds: covalent bonding, ionic bonding, hydrogen bonding and hydrophobic interactions
- Chemical formulas and structural formulas
- Properties of water
- Solutions
- Concentration of solutions
- Chemical reactions
- Acids and bases
- pH and buffers
- Redox reactions
- The chemistry of carbon
- Organic molecules and functional groups
- Alkanes, alkenes, alkynes
- Aromatic hydrocarbons
- Alcohols, Phenols, Thiols
- Aldehydes and ketones
- Carboxylic acids and their derivatives
- Structural Biochemistry
- Properties and classification of amino acids
- Peptide bond
- Structure of proteins
- Carbohydrates: classification of mono-, di- and polysaccharides
- Lipids: fatty acids, triglycerides, glycerol phospholipids, sphingolipids and cholesterol

▪ Physics and Biomechanics

Physical quantities and their measurement - . . Scalar and vector quantities. Operations between vectors. Recalls of mechanics and notions of Biomechanics - Kinematics. Circular motion and harmonic motion. . Principles of dynamics. Work. Power. Power and efficiency. Moment. Static. Elasticity. Levers. Physiological levers. Bone fractures (generalities). Recalls on fluids and applications in biological systems - Density. Viscosity. Hydrostatic pressure. Static of fluids. Stevino's law. Pascal's principle. Principle of Archimedes. Drip. Transfusion. Withdrawal. Drainage. Dynamics of ideal liquids. Bernoulli's theorem. Aneurysm and stenosis. Real liquids. Poiseuille report. Hydraulic resistance.. Thermometry and thermoregulation - temperature and heat. Temperature measurement. Thermometric scales. Clinical thermometers. Specific heat. Thermal balance. State transitions . Heat transmission. Energy balance in the human body. Basal metabolic power. The electric and bioelectric phenomena - charges and electric fields. . Electric current. Laws of Ohm. Elementary circuits. Joule effect. Defibrillator. Risks related to the use of electricity. Waves and radiations - Wave phenomena. Period and frequency. Amplitude and energy. Mechanical waves. The sound. Intensity of sound. Sound pressure and decibels. Stethoscope. Ultrasound in medicine. Electromagnetic waves. The electromagnetic spectrum. Radiation in diagnostics and in therapy. X-ray diagnostics. Radioisotopes and nuclear medicine. Radiotherapy. Biological effects of ionizing radiation. Overview of dosimetry and radioprotection.

TEXTBOOK INFORMATION

- **Chemistry**

- Chimica propedeutica alle scienze bio-mediche (Piccin) Autori: E. Santaniello - M. Coletta - F. Malatesta - G. Zanotti - S. Marini

- **Physics and Biomechanics**

- Physics**

- FISICA**

- D. Scannicchio - Fisica Biomedica - EdiSES, Napoli 2013
