



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata		
ACADEMIC YEAR	2019/2020		
BACHELOR'S DEGREE (BSC)	AUDIOPROTHESIC TECHNIQUES		
INTEGRATED COURSE	PHYSICS AND BIOCHEMISTRY - INTEGRATED COURSE		
CODE	10730		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	FIS/07, BIO/10		
HEAD PROFESSOR(S)	MICCICHE' SALVATORE	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)	MICCICHE' SALVATORE	Professore Ordinario	Univ. di PALERMO
	CARLISI DANIELA	Professore Associato	Univ. di PALERMO
CREDITS	6		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	CARLISI DANIELA Monday 08:30 16:30 Sono disponibile per il ricevimento ogni giorno previo appuntamento, presso la Sezione di biochimica del Policlinico. Accanto la biblioteca di Medicina. Contatto: daniela.carlisi@unipa.it MICCICHE' SALVATORE Tuesday 15:00 17:00 Dipartimento di Fisica e Chimica, Viale delle Scienze, Ed. 18, Studio del docente. Gli studenti sono pregati di iscriversi tramite portale UNIPA. \ Department of Physics and Chemistry, Viale delle Scienze, Ed. 18, Lecturer's office. Students are requested to register through the UNIPA portal.		

PREREQUISITES	The prerequisites are those required at national level in order to access to Courses for Health Professions. In fact, to be admitted to the course of Hearing Aid Techniques, In particular, the student must possess basic knowledge of: trigonometry, algebra, general chemistry, organic chemistry and biology.
LEARNING OUTCOMES	Knowledge and understanding To know and to understand the basic principles of physics of biological systems, Knowledge and understanding of descriptive statistics methodologies, probability calculus and measurement of accuracy of diagnostic tests. Acquire a specific language of the disciplines of applied physics. Knowledge and understanding of the fundamental biological processes of living organisms, Applying knowledge and understanding The student must have full knowledge of the basic principles of physics and medical statistics, and must be able to know how to choose the instrumental technique more suitable for a physiological parameter measurement. He must know how to evaluate the accuracy of the measurement of a physiological parameter. He must be able to assess the physical and biochemical principles that underlie certain physiological mechanisms and their relevance for diagnostic purposes. Finally, the student must know how to apply basic concepts of physics and biochemistry to practical examples and to problem-solving. The student must know the molecules of biological interest and the main biochemical processes in which they are involved, know and understand the mode of action of enzymes, the bases of their regulation and catalysis, the bases of bioenergetics. He will have to know and understand the general mechanisms of extracellular signal transduction with particular reference to the biochemical mechanisms involved in some relevant human diseases or those more common or of high incidence in the territory. Students will also know how to apply the acquired knowledge to read and critically interpret the most important scientific literature in the context of programs for the prevention and rehabilitation of deafness, they will have the capacity for analysis, synthesis and argumentation and critical and connecting skills, with reference to the topics treated . Making Judgments Being able to evaluate and integrate independently the acquired knowledge in physics and biochemistry in the study of organisms and in particular human ones as well as the implications of process alterations on human pathologies biological at the base of cell life. Communication skills Ability to correctly describe the physical principles underlying a biomedical and biological phenomenon, presenting in a clear and rigorous way the hypothesized model, the mathematical procedure used and the results obtained. Ability to expound the acquired biochemical knowledge in a clear and rigorous way, stating in a correct manner and with appropriate vocabulary definitions, problems and mechanisms concerning the contents of the course itself. Learning skills Capacity to deepen, not in a notional way but rather with a critical and quantitatively founded approach, the concepts presented during the course, even through the study of different texts. Ability to take into account the approximations on which a physical model is based, and therefore of its limitations in effectively describe the biological and biomedical processes. Ability to develop self learning capacities in the biomedical field, in order to continue studying independently.
ASSESSMENT METHODS	The examination consists of a written test that may be followed by an oral test. The written test will consist of multiple-choice and open response tests. The tests will cover all parts of the program. This test aims to assess whether the student has knowledge and understanding of the topics. It is passed if the candidate scores at least 15/30. During the oral examination, the candidate will have to answer questions posed orally on all parts of the program. This check aims at assessing whether the student has knowledge and understanding of the topics and has acquired interpretative and communicative skills. The oral test is compulsory if the written test score is less than 18/30. The oral examination is at the discretion of the Commission if the written test score exceeds 18/30. It may be requested by the student only if he/she has obtained a score higher than 18/30 in the written test. The final evaluation will be graded based on the following scale: A) Excellent knowledge of teaching content; the student demonstrates high analytic-synthetic capacity and is able to apply the knowledge to solve highly

	complex problems (score 30, 30L; Excellent) B) Excellent knowledge of teaching content and excellent properties of language; students demonstrate analytical and synthetic skills and able to apply their knowledge to solve problems of medium complexity and, in some cases, even higher (score 27-19; Very Good) C) Good knowledge of teaching content and good properties of language; the student is able to apply knowledge to solve problems of medium complexity (score 24-26; Good) D) Satisfactory knowledge of teaching content, in some cases limited to the main topic; acceptable ability to use the specific language of the discipline and independently apply the knowledge gained (score 21-23; Satisfactory) E) Minimum knowledge of teaching content, often limited to the main topics; modest ability to use the specific language of the discipline and independently apply the knowledge acquired (score 18-20; Sufficient) F) Do not have an acceptable knowledge of the main teaching content; very little or no ability to use the specific language of the discipline and independently apply the acquired knowledge (score 1-17; Fail)
TEACHING METHODS	Lectures in classroom. During the lectures elementary concepts of physics and biochemistry are taught. Lessons are given through lectures and exercises, also with the help of information technology and slides that can be downloaded from the UNIPA portal.

MODULE ACOUSTIC PHYSICS

Prof. SALVATORE MICCICHE'

SUGGESTED BIBLIOGRAPHY

D. Scannicchio
Fisica biomedica
Edises, Napoli

E. Ragozzino,
Elementi di Fisica Per studenti di scienze biomediche,
EdiSES, Napoli, 1998.

AMBIT	10337-Scienze propedeutiche
INDIVIDUAL STUDY (Hrs)	45
COURSE ACTIVITY (Hrs)	30

EDUCATIONAL OBJECTIVES OF THE MODULE

- To have a good basic knowledge about different physical phenomena at the root of a biomedical and biological phenomenon.
- Acquire a certain familiarity with the scientific method of investigation and, in particular, with the modeling of biomedical and biological real problems.
- Acquiring skills to critically evaluate the physical models used, identifying their operational benefits and limitations.
- Have adequate understanding of mathematical tools as well as the capacity to use them.

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the course. Primitive and derived physical quantities. the Unit systems. Dimensional equations . Scalar and Vectorial physical quantities. Vectors.
3	Sum and difference of vectors, scalar and vector product. Significant digits. Brief notes on the Theory of errors. Kinematics: space, speed and acceleration. Uniform rectilinear motion and uniformly accelerated motion. Time Law and time diagrams. Brief notes on the uniform circular motion.
2	The First Principle of dynamics. Mass definition, the Second Principle of dynamics. Types of forces: weight force, elastic force, motion of an object in free fall. Projectile motion. Strength of static and dynamic friction.
3	Work of a force, kinetic energy theorem, power. Conservative forces, conservation of energy theorem. Statics of the human body. Size of the vertebrae. Speed in prey and racing animals.
2	Physical quantities of fluid dynamics: pressure and density. Ideal fluids: Stevin's law, Archimedes' principle, Principle of Communicating Vessels.
2	Ideal Fluid Dynamics: Equation of Continuity. Bernoulli's theorem. Stenosis. Aneurysm.
2	Real fluids: Viscosity, Poiseuille Law, hydrodynamic resistance. Dynamics of real fluids: notes on laminar and turbulent motion.
2	Transport in viscous regime: Stokes Law, the erythrocyte sedimentation speed, centrifuges.
2	Electric charges, electric currents and magnetic phenomena. Force of Coulomb and Force of Biot-Savart. Resistors, Capacitors, Inductances. Ohm's law. RC circuits. RLC circuits.
2	Waves and their characteristics: amplitude, velocity, wavelength and period. Wave equation. Transverse and longitudinal mechanical waves. Energy of mechanical waves. Superposition of waves. Refraction and reflection. Diffraction (basic concepts).
2	Maxwell equations. Electromagnetic waves. Electromagnetic spectrum. Energy of Electromagnetic waves. Photons. Superposition of waves. Refraction and reflection. Diffraction (basic concepts).
2	Doppler effect. Doppler velocimetry. Echography.
2	The sound and its propagation. Physical properties of the sound. Stethoscope.
2	Sound perception. Unit of measurement of sound pressure (decibel). Spectral decomposition of sound waves. Acoustic impedance. Characteristic impedance of the middle ear.

MODULE BIOCHEMISTRY

Prof.ssa DANIELA CARLISI

SUGGESTED BIBLIOGRAPHY

"Chimica e Biochimica" di Bertoldi M, Colombo D, Magni F, Marin O, Palestini P; ed EdiSES.

"Le basi della biochimica" di Denise R Ferrier; ed. Zanichelli.

"Introduzione alla biochimica di Lehninger" di Nelson D. L e Cox MM, ed. Zanichelli

AMBIT	10338-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	45
COURSE ACTIVITY (Hrs)	30

EDUCATIONAL OBJECTIVES OF THE MODULE

The objective of the biochemistry module is to provide students with the knowledge necessary to understand the main biochemical processes that allow cell life and the functioning of the organism as a whole. To this end, The student must know the structure and function of the main biological macromolecules; understand the main metabolic processes; know the mechanisms that regulate and integrate biochemical processes and connect them with some pathological conditions.

SYLLABUS

Hrs	Frontal teaching
3	Overview of general chemistry
3	Biological macromolecules. Carbohydrates. Lipids. Nucleic acids. Outline of vitamins
3	Aminoacids. Essential and no-essential amino acids. Chemical characterization, peptide bond: alfa-amino acids structure, classification according to the polarity of the side chain R. Peptide bond. Protein structure and different levels of molecular organization. Basics of Protein folding and misfolding diseases Oxygen-binding chromoproteins. Myoglobin (Mb). Hemoglobin (Hb).
2	Enzyme: General concepts. Mechanism of enzymatic catalysis. The active site. Enzyme specificity. Isoenzymes. Constitutive and inducible enzymes . Enzyme kinetics. Coenzymes and prosthetic groups.
2	Structure and composition of biological membranes. Membrane transport. Osmosis. Simple and facilitated diffusion. Glucose transporters (GLUTs). Primary and secondary active transport. Sodium-glucose symporter. Sodium/potassium –dependent ATPase.
3	Membrane receptors and signal transduction mechanisms. Notes on neurotransmission
2	Metabolism: Introduction to metabolism: catabolic and anabolic pathway. Role of ATP and reducing power in the connection between catabolism and anabolism.
3	Metabolism of carbohydrates: digestion of polysaccharides and disaccharides; absorption of monosaccharides. Glycolysis, pentose phosphate pathway, Glycogen metabolism : glycogen synthesis and glycogen lysis. Oxidation of pyruvate. Krebs cycle. Oxidative phosphorylation: the electron transport chain and ATP synthesis. Gluconeogenesis.
3	Metabolism of lipids. Metabolism of triglycerides. Beta-oxidation of fatty acids. Biosynthesis of fatty acids. Metabolic utilization of fatty acids. Lipoprotein: general concepts . Chylomicrons, VLDL and their metabolism. LDL receptors . Atherosclerosis. Metabolism of ketone bodies.
3	Metabolism of amino acids. Digestion of protein. Amino acid catabolism. Transamination. Oxidative deamination. Ammonia metabolism. Plasmatic protein.
3	Metabolic interrelationships. Role of insulin and glucagon. The main metabolic diseases (diabetes, atherosclerosis and obesity).