UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata		
ACADEMIC YEAR	2023/2024		
BACHELOR'S DEGREE (BSC)	AUDIOPROTHESIC TECHNIQUES		
INTEGRATED COURSE	PHYSICS AND BIOCHEMISTRY - INTEGRATED COURSE		
CODE	10730		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	BIO/10, FIS/07		
HEAD PROFESSOR(S)	CARLISI DANIELA	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	CARLISI DANIELA BUTTACAVOLI ANTONINO	Professore Associato Ricercatore a tempo determinato	Univ. di PALERMO Univ. di PALERMO
CREDITS	7		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**BUTTACAVOLI ANTONINO** Wednesday 11:00 13:00 Dipartimento di Fisica e Chimica, Viale delle Scienze,Edificio 18, Palermo **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		

DOCENTE: Prof.ssa DANIELA CARLISI

PREREQUISITES	The prerequisites concern the knowledge acquired in the previous school path; the student must have basic knowledge of chemistry, biology, biochemistry, physics and mathematics. These prerequisites are those established at national level for access to Healthcare Professional Courses.
LEARNING OUTCOMES	Knowledge and understanding ability Know and understand the basic principles of the physics of biological systems, the general aspects of the structure and properties of organic compounds and macromolecules of biological interest and the molecular mechanisms underlying metabolic processes. Acquire a specific language of the disciplines of Biochemistry and applied physics. Ability to apply knowledge and understanding The student must have full knowledge of the basic principles of physics and Biochemistry and must be able to choose the most suitable instrumental technique for measuring a physiological parameter. Knowing how to evaluate the accuracy of the measurement of a physiological parameter. Knowing how to evaluate the physical and biochemical principles that underlie certain physiological mechanisms and their relevance for diagnostic purposes. The student will have to know how to apply the basic concepts of physics and biochemistry to practical examples and problem solving. Judgment autonomy Being able to evaluate and integrate, independently, the knowledge acquired in physics and biochemistry in the study of organisms and in particular of man; Communication skills Ability to correctly describe the physical principles underlying a biomedical and biological phenomenon, clearly and rigorously presenting the hypothesized model, the mathematical procedure used and the results obtained. Learning ability Ability to deepen, not in notional form but with a critical and quantitatively founded approach, the concepts exposed during the course, also through the study of different texts. Ability to take into account the approximations on which a physical model is based, and therefore its limits in effectively describing biological and biomedical processes. Ability to develop independent learning methods, updating in the biomedical field, in order to continue studying autonomously.
ASSESSMENT METHODS	The exam for both modules consists of an oral exam. During this test, the candidate will have to answer no less than three questions on all parts of the program. This test aims to assess whether the student has knowledge and understanding of the topics on the program and has acquired interpretative and expository skills. It is considered passed if the candidate obtains a score of at least 18/30 (in both modules). The modalities may vary according to the health emergency and the Rectoral indications, but will be promptly communicated to the students. The final evaluation will be graded on the basis of the following conditions: A) Excellent knowledge of the teaching content; the student demonstrates high analytical-synthetic ability and is able to apply knowledge to solve problems of high complexity (grade 30, 30L; Excellent) B) Excellent knowledge of teaching content and excellent language properties; the student demonstrates analytical-synthetic ability and able to apply knowledge to solve problems of medium complexity and, in some cases, even high (grade 27-29; Excellent) C) Good knowledge of teaching content and good language properties; the student is able to apply the knowledge to solve problems of medium complexity (grade 24-26; Good) D) Fair knowledge of the teaching content, in some cases limited to the main topics; acceptable ability to use the specific language of the discipline and to independently apply the knowledge acquired (grade 21-23; Conversational) E) Minimum knowledge of the teaching content, often limited to the main topics; modest ability to use the specific language of the discipline and to independently apply the knowledge acquired (score 18-20; Enough) F) Does not have an acceptable knowledge of the main contents of the course; very little or no ability to use language
TEACHING METHODS	frontal lessons

MODULE
ACOUSTIC PHYSICS

Prof. ANTONINO BUTTACAVOLI

SUGGESTED BIBLIOGRAPHY	
D. Scannicchio, Fisica biomedica, Edises, Napoli, ISBN 978-8879598873 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

- obtain a good knowledge of several phenomena in the field of physics that are relevant for biomedical and biological applications
- understand and assimilate the epistemological implications of the scientific method, with a particular interest towards models of biomedical and biological phenomena
- learn to critically evaluate the adopted models, identifying their limits and understanding their advantages
- have a good operational understanding of several mathematical tools

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the course. Physical dimensions. Distinction between primitive and composite. Units of measurement. Dimensional equations. Vector vs scalar physical quantities. Vectors
3	Sum and difference of vectors. Scalar and vector product. Significant digits. Error theory. Cinematic quantities: space, speed, acceleration. Uniform rectilinear motion and uniformly accelerated rectilinear motion. Uniform circular motion.
2	First principle of dynamics. Definition of mass. Second principle of dynamics. Forces: elastic forces, gravitational force. Gravitational motion. Motion of a falling body. Motion of a projectile. Friction, static vs dynamical.
3	Work. Theorem of kinetic energy, power. Conservative forces. Theorem of the conservation of energy.
2	Exercises.
2	Fluid dynamics, pressure and density. Ideal fluids: Stevino's law, Archymedes' principle, Principle of communicating vessels.
2	Dynamics of Ideal fluids: Leonardo's law, Bernoulli's theorem. Stenosis. Aneurysm.
4	Thermodynamics: first law of thermodynamics, ideal and real gases, second law of thermodynamics.
2	Waves and their characteristics: amplitude, speed, wavelength and period. Wave equation. Transversal and Longitudinal Mechanical Waves. Energy of mechanical waves. Waves overlap. Reflection and refraction.
2	Doppler's effect. Doppler ultrasonography.
2	Exercises.
2	Sound and its propagation. Physical properties of sound. Stethoscope.
2	Perception of sound. Unit of measurement of sound pressure (decibel). Spectral decomposition of sound waves. Acoustic impedance. Impendance of human ear.

MODULE
BIOCHEMISTRY

Prof.ssa DANIELA CARLISI

SUGGESTED BIBLIOGRAPHY

"Introduzione alla biochimica di Lehninger" di Nelson D. L e Cox MM, ed. Zanichelli; Sesta edizione; ISBN: 9788808723284
"Le basi della biochimica" di Emine E. Abali, Susan D. Cline, David S. Franklin, Susan Viselli terza edizione italiana condotta sulla ottava edizione americana a cura di Niccolò Taddei; ed Zanichelli; ISBN: 9788808299826. 2023
"Chimica e Biochimica" di Bertoldi M, Colombo D, Magni F, Marin O, Palestini P; ed EdiSES. 2015; ISBN 9788879598781

AMBIT	10338-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	60
COURSE ACTIVITY (Hrs)	40

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
5	Biological macromolecules: Carbohydrates, Lipids, proteins and Nucleic acids.
4	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 diseasesOxygen-binding chromoproteins. Myoglobin (Mb). Hemoglobin (Hb).
3	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 –dependentATPase.
4	Membrane receptors and signal transduction mechanisms. Notes on neurotransmission. The main metabolic diseases (diabetes, atherosclerosis and obesity).
3	Metabolism: Introduction to metabolism: catabolic and anabolic pathway. Role of ATP and reducing power in the connection between catabolism and anabolism. Role of insulin and glucagon.
5	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.
2	Metabolism of amino acids. Digestion of protein. Amino acid catabolism. Transamination. Oxidative deamination. Ammonia metabolism. Plasmatic protein.

Hrs	Workshops
6	practise