UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata		
ACADEMIC YEAR	2017/2018		
BACHELOR'S DEGREE (BSC)	SPEECH THERAPY		
INTEGRATED COURSE	PHYSICS, BIOCHEMISTRY, APPLIED BIOLOGY AND GENETICS		
CODE	16952		
MODULES	Yes		
NUMBER OF MODULES	3		
SCIENTIFIC SECTOR(S)	FIS/07, BIO/10, BIO/13		
HEAD PROFESSOR(S)	GRIMAUDO STEFANIA	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	MICCICHE' SALVATORE	Professore Ordinario	Univ. di PALERMO
	CARLISI DANIELA	Professore Associato	Univ. di PALERMO
	GRIMAUDO STEFANIA	Professore Associato	Univ. di PALERMO
CREDITS	10		
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 **GRIMAUDO STEFANIA** Monday 10:00 12:00 Studio docente Piazza delle Cliniche,2, piano -1. Dipartimento PROMISE previo appuntamento MAIL Wednesday 10:00 12:00 Studio docente Piazza delle Cliniche,2, piano -1. Dipartimento PROMISE previo appuntamento MAIL **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.		

DOCENTE: Prof.ssa STEFANIA GRIMAUDO

PREREQUISITES	None.
LEARNING OUTCOMES	Knowledge and understanding - Acquisition of the specific language of Biology, Genetics, Biochemistry and Applied Physics topics; - to Know and understand the basic biological processes of living organisms, the way in which hereditary characteristics are transmitted to the offsprings and the basic principles of physics of biological systems. - to know and understand the genetic basis of the most common human diseases or those diseases with an high incidence in the territory. Applying knowledge and understanding Ability to distinguish, organize and implement, in a independent way: - the knowledge of basic biological and biochemical processes of cells and organisms; - The laws which regulate the transmission of hereditary characteristics in living species; - The main methods of cell biology, biochemistry and molecular genetics. In addiction, the student must have full knowledge of the basic principles of physics 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 principles that underlie certain physiological mechanisms and their relevance for diagnostic purposes. Finally, the student must know how to apply basic concepts of physics to practical examples and to problem-solving. Making judgments Being able to evaluate and integrate, in an autonomous manner: - The acquired knowledge in biology, biochemistry , genetics and physics in the study of organisms and in particular human ones; -the consequences of the alterations of biological processes on human diseases. Communication skills Ability to communicate and explain, in a simple way, even to a non-expert public, the biological, biochemical and genetic processes. 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. Learning ability 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 properly use the scientific literature for a continuous update of knowledge in the biomedical field.Ability to learn and follow appropriately, using the knowledge acquired in the course, the subsequent teaching courses of the curriculum for the final degree in Logopedia.
ASSESSMENT METHODS	There will be a test of the duration of 180 minutes (60' each module) including problems about physics topics, question with multiple choises (a-e) and/or open questions about biochemistry, biology and genetics topics. Each multiple choice question will be valued +1 (exact) or 0 (wrong) while each open question will receive a score from 0 to 4 with 4 the highest score and 0 the lowest score. The final mark will be calculate as average between the results. The test could be followed by an oral examination usually lasting 20-30 minutes. The questions tend to verify a) the knowledge gained, and b) the ability of elaborative and synthesis skills. As for the assessment of knowledge, it will be required the ability to contextualize the topic within a specific process. As for the verification of the elaborative abilities, it will be evaluated the ability to extrapolate the minimum details of the process in a clear and concise manner and the understanding of their implications for the topic. The evaluation scheme is the following: 30-30 e Lode: A-A+ Excellent: more than good acquisition of the course content and excellent language abilities and synthesis abilities 27-29: B Very good: very good knowledge of the issues and good language abilities; the student is very able to correlate the different topics which has studied 24-26: C Good: good knowledge of the issues and good language abilities; the student is able to correlate the different topics which has studied 21-23: D Satisfactor: just enough knowledge of the subject, and limited language

	18-20: E Sufficient : minimum basic knowledge of the subject requested and poor elaborative capacity 1-17: F Fail: insufficient knowledge of the contents required by the specific question or the student does not answer.
TEACHING METHODS	Lessons in the classroom

MODULE
APPLIED MEDICAL 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	10318-Scienze propedeutiche
INDIVIDUAL STUDY (Hrs)	60
COURSE ACTIVITY (Hrs)	40

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, Poiseuville 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	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.
2	Maxwell equations. Electromagnetic waves. Electromagnetic spectrum. Energy of Electromagnetic waves. Photons. Superposition of waves. Refraction and reflection. Diffraction.
2	Doppler effect. Doppler velocimetry. Echography.
2	The sound and its propagation. Physical properties of the sound. Stethoscope.
2	Physical quantities of Thermodynamics: Temperature and Heat. Brief notes on specific heats. Thermal expansion of solids and liquids. Calorimetry. Thermodynamic systems. Mechanical equivalent of the calorie. Internal Energy and the First law of Thermodynamics
2	Ideal gases. Thermodynamic transformations of an ideal gas.
3	Statistical foundations of the concept of entropy. Entropy and the second law of thermodynamics: Clausius statement.
2	Thermodynamic potentials: entropy, enthalpy, free energy.
2	Physical characterization of semipermeable membranes in biological systems. Diffusion of solutes in solution. Fick's laws of diffusion.
3	Semipermeable membranes and osmotic balance. Van't Hoof Law. Osmotic work and chemical potentials. Osmotic equilibrium in biological systems. Electrochemical potentials. Nernst equation. Donnan-Gibbs equilibrium, Action potential.

MODULE
BIOCHEMISTRY

Prof.ssa DANIELA CARLISI

SUGGESTED BIBLIOGRAPHY

Le basi della biochimica": Denise R Ferrier; ed. Zanichelli
"I principi di biochimica": Lehninger David L. Nelson, Michael M. Cox; ed. Zanichelli
“BIOCHIMICA”: Campbell- Farrel – ed. Edises

AMBIT	10319-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
2	Chemical properties of water; the structure of water, the hydrogen bond, hydrolysis, pH.
1	Carbohydrates: Definition and description of carbohydrates; generality and biological role; classification. Monosaccharides: aldoses and ketosis. Structure and configuration of D-glucose. The glycosidic bond. Disaccharides, polysaccharides.
1	Lipids: biological characteristics of lipids; physical properties. Various types of lipids and common characteristics. The fatty acids: chemical and physical properties. Triglycerides.
2	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.
3	Enzyme: General concepts. Mechanism of enzymatic catalysis. The active site. Enzyme specificity. Isoenzymes. Constitutive and inducible enzymes . Enzyme kinetics. Coenzymes and prosthetic groups. Oxygen-binding chromoproteins. Myoglobin (Mb). Hemoglobin (Hb).
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.
2	Membrane receptors and signal transduction mechanisms.
2	Metabolism: Introduction to metabolism: catabolic and anabolic pathway. Role of ATP and reducing power in the connection between catabolism and anabolism.
7	Metabolism of carbohydrates: digestion of polysaccharides and disaccharides; absorption of monosaccharides. Glycolysis, 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.
2	Metabolic interrelationships between: carbohydrates, lipids and proteins. Role of insulin and glucagon

MODULE
APPLIED BIOLOGY AND GENETICS

Prof.ssa STEFANIA GRIMAUDO

SUGGESTED BIBLIOGRAPHY

H. Curtis, N. S. Barnes, "Le basi della biologia" (cellula, genetica, evoluzione), Zanichelli Editore
Bonaldo, Duga, Pierantoni, Riva, Romanelli “Biologia e Genetica” EdiSES Editore.
David Hillis, David Sadava, Craig Heller, Mary Price “Elementi di Biologia e Genetica”, Zanichelli Editore.
N. A. Campbell, J.B. Reece “Biologia e Genetica” Pearson Editrice.

AMBIT	10319-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	45
COURSE ACTIVITY (Hrs)	30

EDUCATIONAL OBJECTIVES OF THE MODULE

Distinguish viruses, prokaryotic and eukaryotic cell.
Identify the main biological structures, the organization and functioning of a eukaryotic cell.
Analyze the flow of the genetic information and the mechanisms of gene expression in prokaryotes and eukaryotes.
Analysis and comparison of genomic stability and variability. Main mutation type.
Understanding genetic inheritance modes and genotype-phenotype relationship.
Genetic inheritance in humans. Modes of transmission of wild type and mutated genes.

SYLLABUS

Hrs	Frontal teaching
4	Biological macromolecules: phospholipids, protein end nucleic acid structres and functinons.
4	Structural and functional cell organization. Prokaryotic and eukaryotic cells. Citomembrane: organization and functional examples.
2	Human gene and genome organization. DNA replication.
4	"Transcription" and maturation of eukaryotic mRNA. The genetic code. Protein synthesis.
4	Cell cycle, mitosis. Meiosis and gametogenesis in humans.
4	Mendelian inheritance rules: dominant and recessive phenotypes, Law of Segregation, Law of Independent Assortment. Punnett square. Non-Mendelian inheritance: co-dominance, incomplete dominance, multiple alleles, polygenic traits.
4	Human genetic: genotype and phenotype. Genetic inheritance in humans. Modes of transmission. Chromosomal and genomic aberrations.
4	Genotype and phenotype relationship: penetrance and expressivity, allelic and non allelic heterogeneity. Genetics mosaicism: X-inactivation. Examples of inehritance disease.