



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata		
ACADEMIC YEAR	2018/2019		
BACHELOR'S DEGREE (BSC)	PSYCHIATRIC REHABILITATION TECHNIQUE		
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
	SCHIERA GABRIELLA	Professore Associato	Univ. di PALERMO
CREDITS	8		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	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.		
	SCHIERA GABRIELLA Thursday 10:00 12:00 Dipartimento STEBICEF, viale delle Scienze edificio 16; previo contatto via mail: gabriella.schiera@unipa.it		

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 TECHNIQUE OF PSYCHIATRIC REHABILITATION , perspective students must pass a mandatory access competition based on tests that also include questions related to physics and biochemistry .
LEARNING OUTCOMES	<p>Knowledge and understanding To know and to understand the basic principles of physics of biological systems, the general aspects of the structure and properties of organic compounds and of biological macromolecules and molecular mechanisms of metabolic processes. Acquire a specific language of biochemistry disciplines and applied physics.</p> <p>Applying knowledge and understanding The student must have full knowledge of the basic principles of physics and biochemistry, 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.</p> <p>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.</p> <p>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.</p> <p>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.</p>
ASSESSMENT METHODS	<p>The examination consists of a written test that may be followed by an oral test.</p> <p>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.</p> <p>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.</p> <p>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;</p>

	<p>modest ability to use the specific language of the discipline and independently apply the knowledge acquired (score 18-20; Sufficient)</p> <p>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)</p>
TEACHING METHODS	Lectures in classroom. During the lectures elementary concepts of physics and basic biochemistry are taught.

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, 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	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
CHEMISTRY AND BIOCHEMISTRY PROPAEDEUTICS

Prof.ssa GABRIELLA SCHIERA

SUGGESTED BIBLIOGRAPHY

Biochimica-Campbell Farrell- Edises
Biochimica molecole e metabolismo Appling; Antony-Cahill; Mathews. Pearson

AMBIT	10319-Scienze biomediche
--------------	--------------------------

INDIVIDUAL STUDY (Hrs)	60
-------------------------------	----

COURSE ACTIVITY (Hrs)	40
------------------------------	----

EDUCATIONAL OBJECTIVES OF THE MODULE

To know the structure and function of the main biological macromolecules; To understand the main metabolic processes; To Know the mechanisms that regulate and integrate biochemical processes and then use this knowledge to understand some typical abnormalities of common diseases.

SYLLABUS

Hrs	Frontal teaching
2	Introductory concepts: atom, electron configuration, periodic table, elements and compounds, the concept of electro negativity, chemical bonds, ionic bonds, covalent bonds, hydrogen bonds, Van der Waals forces, the structure and the properties of water, the role of chemical bonds in biological molecules, acids and bases, strength of acids and a bases, ph, buffer systems, major buffer system in the blood, osmotic pressure and oncotic pressure.
2	Main classes of biological molecules: properties and functional groups of carbohydrates, lipids and proteins: hydroxyl (alcohol group), carbonyl group (aldehydes and ketones), carboxyl group (organic acids), amino group, phosphate group, sulfhydryl group, hydrophilic and hydrophobic groups.
2	The Carbohydrates: structure of carbohydrates, stereoisomers, disaccharides and polysaccharides, the glycosidic bond, monosaccharides and their reactions (reduction, esterification with phosphoric acid), disaccharides (sucrose, maltose, lactose), polysaccharides, homopolysaccharide (starch, glycogen), the heteropolysaccharides (chondroitin sulfate, hyaluronic acid, keratan sulfate).
2	Lipids: classification in neutral lipids, phospholipids, steroids, glycolipids, fatty acids (saturated and unsaturated), the structure of glycerol and triglycerides, phospholipids, importance of the phospholipids in the structure of the biological membrane, glycolipids, steroids (cholesterol)
3	Proteins: structure of proteins, amino acids and chemical properties (acids aa, basic aa, neutral aa), the peptide bond, combination of proteins with other substances (glycoproteins, prosthetic groups, coenzymes); denaturation; Turnover; Relevance of folding and related diseases. Collagen: structure, function, and related diseases.
3	Enzymes: general characteristics, recognition enzyme-substrate, " lock and key model" and "adaptation induced model" activation energy and the transition state, and Michelis Menten kinetic, modulation of enzyme activity, enzyme inhibition; Dosage of the enzyme activity; plasma enzymes; enzymes as markers of disease, drugs as enzyme inhibitors.
3	Oxygen binding proteins. Myoglobin and hemoglobin: structure, function, and diseases related.
1	Biological membranes: structure of membranes, transport through membranes: simple and facilitated diffusion; Active and passive transport.
2	Bioenergetics: energy, metabolism, chemical reactions in the cell (endergonic and exergonic reactions , ATP , the electron carriers (NAD and FAD), oxidation-reduction (redox) reactions.
3	Metabolism of carbohydrates : glycolysis , alcoholic and lactic fermentation , Cori cycle. Gluconeogenesis . Pentose phosphate pathway. Decarboxylation of pyruvate , the Krebs cycle , shuttle systems for reducing equivalents , the electron transport chain , oxidative phosphorylation , uncoupling agents . Glycogen synthesis and glycogenolysis.
3	Lipid metabolism: lipid metabolism, regulation of the release of fatty acids. Catabolism of lipids: the use of glycerol. Fatty Acid Activation and Transport into the Mitochondria, carnitine system. Beta oxidation of saturated and unsaturated fatty acids,oxidation of fatty acids with an odd or even number of carbons. Lipogenesis. Triglyceride metabolism. metabolism of cholesterol. Ketone bodies. Integration of carbohydrates and lipids metabolism. Digestion and absorption of lipids. Structure and function of lipoproteins. Atherosclerosis (brief outlines).
2	Amino acids metabolism: essential and nonessential amino acids, amino acid catabolism, transamination, ALT, AST, deamination, trans-deamination, decarboxylation, metabolic fate of ammonia, Glutamate, Glutamine. Urea cycle.
5	Hormones: Membrane Receptors and Signal Transduction: general characteristics, classification and mechanism of action of peptide, amino acids derived and steroid hormones. Insulin, glucagon, and brief outlines on Diabetes. Hypothalamus-pituitary axis. Hypothalamic releasing hormones: mechanism of action. Hormones released by the pituitary gland: mechanisms of action.

