UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata
ACADEMIC YEAR	2023/2024
BACHELOR'S DEGREE (BSC)	NEUROPHYSIOPATHOLOGY TECHNIQUES
INTEGRATED COURSE	BIOLOGICAL AND MOLECULAR BASES OF LIFE
CODE	22325
MODULES	Yes
NUMBER OF MODULES	3
SCIENTIFIC SECTOR(S)	BIO/13, MED/03, BIO/10
HEAD PROFESSOR(S)	
OTHER PROFESSOR(S)	DI LIBERTO DIANA — Ricercatore a tempo determinato — Univ. di PALERMO PICCIONE MARIA — Professore Associato — Univ. di PALERMO PIPITONE ROSARIA MARIA — 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	**DI LIBERTO DIANA** Wednesday 15:00 18:00 Biochimica del Policlinico di Palermo Thursday 15:00 17:00 Biochimica del Policlinico di Palermo. **PICCIONE MARIA** Friday 13:00 14:00 UOC Genetica Medica Ospedale Cervello via Trabucco 180 Palermo **PIPITONE ROSARIA MARIA** Wednesday 14:30 16:30 Laboratorio di Patologia Molecolare sito al II piano del Dipartimento Promise, piazza delle cliniche n. 2. Previo appuntamento tramite il seguente indirizzo e-mail: rosariamaria.pipitone@unipa.it. Thursday 15:00 17:00 Laboratorio di Patologia Molecolare sito al II piano del Dipartimento Promise, piazza delle cliniche n. 2. Previo appuntamento tramite il seguente indirizzo e-mail: rosariamaria.pipitone@unipa.it. Friday 12:00 14:00 Laboratorio di Patologia Molecolare sito al II piano del Dipartimento Promise, piazza delle cliniche n. 2. Previo appuntamento tramite il seguente indirizzo e-mail: rosariamaria.pipitone@unipa.it.

DOCENTE:

PREREQUISITES	Knowledge of the basics of general chemistry and organic chemistry. Knowledge of the structure of the eukaryotic cell and its compartments.
LEARNING OUTCOMES	Knowledge and understanding: Acquisition of the specific language of the disciplines of Biology, medical genetics and Biochemistry; Know the basics of the cellular organization of living organisms; know and understand basic biological processes such as growth, cell division, sexual reproduction and embryonic development; the mechanisms of replication of the genetic material and the onset of its variability; the mechanisms of gene expression, the genetic problems of heredity and the ways of transmitting hereditary traits. to know and understand the characteristics of biological molecules and the principles underlying their chemical-physical behavior, to know the structure and properties of organic compounds, to know the molecules of biological interest and some cellular metabolic processes; --- Ability to apply knowledge and understanding: Ability to autonomously recognize and apply the knowledge of basic biological and biochemical processes of cells and organisms; the laws governing the transmission of hereditary characteristics. --- Autonomy of judgment: Being able to independently evaluate and integrate the knowledge acquired in biology, genetics and biochemistry in the study of organisms and in particular of man; the implications that alterations of biological, biochemical and cellular processes have on human pathologies; --- Communication skills: Ability to explain in a simple way and communicate clearly, the main processes of biology, genetics and biochemistry. ---Learning ability: Ability to update knowledge in the biomedical field through consultation of the scientific bibliography specific to the sector of competence; Ability to learn and follow suitably, using the acquired knowledge, the subsequent courses of one's study curriculum; Ability to deepen the topics also by attending specific courses or seminars or 1st level Masters
ASSESSMENT METHODS	Learning is assessed through an individual interview. During this oral test the student will have to answer at least three questions for each module of the integrated Course (biochemistry, biology and medical genetic), related to the topics developed during the course, proving to possess an adequate knowledge and competence Interpretative of the general and specific contents, capacity of linking and elaboration of the contents, as well as a clear exhibition ability. The evaluation of the test is expressed in thirtieth with an integrated evaluation of the two modules and is considered insufficient if the student proves: difficulty in focusing the proposed topics, knowledge strongly lacking in the topics and extreme exposure limitation. As the degree of detail of the knowledge demonstrated by the student increases proportionally the positivity of the evaluation. The maximum score is obtained in case of excellent mastery and critical-interpretative competence of the contents covered by the course, associated with good exhibition skills attested by the use of appropriate scientific terminology.
TEACHING METHODS	The course includes frontal lectures

MODULE
BIOCHEMISTRY

Prof.ssa DIANA DI LIBERTO

SUGGESTED BIBLIOGRAPHY

"Introduzione alla biochimica di Lehninger" di Nelson D. L e Cox MM, ed. Zanichelli; Sesta edizione; ISBN: 9788808723284
"Fondamenti di biochimica umana" Mauro Maccarrone ed. Zanichelli; 2021 ISBN: 9788808420190
"Biochimica Medica" di Siliprandi. Tettamanti, Ed. Piccin; 2018; ISBN 978-88-299-2791-3
"Le basi della biochimica" di Denise R Ferrier; ed. Zanichelli. 2015 ISBN: 9788808354006
"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)	30
COURSE ACTIVITY (Hrs)	20

EDUCATIONAL OBJECTIVES OF THE MODULE

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 finally use this knowledge to understand some typical abnormalities of common pathological states.

SYLLABUS

Hrs	Frontal teaching
1	Introductory concepts: atoms, electron configuration, periodic table, elements and compounds, concept of electronegativity, chemical bonds, ionic bonds, covalent bonds, hydrogen bonds, van der Waals forces, structure and properties of water, role of chemical bonds in biological molecules, acids and bases, strength of an acid and a base, ph, tampons, buffer systems in the blood, osmotic pressure.
1	Main classes of biological molecules: properties and functional groups of carbohydrates, lipids and proteins: hydroxyl group (alcohols), carbonyl group (aldehydes and ketones), carboxyl group (organic acids), amino group, phosphate group, sulfhydril group, hydrophilic groups and hydrophobic groups.
1	Carbohydrates: structure of carbohydrates, stereoisomers, disaccharides and polysaccharides, glycosidic binding, monosaccharides and their reactions (reduction, esterification with phosphoric acid), disaccharides (sucrose, maltose, lactose), polysaccharides, homopolysaccharides (starch, glycogen)
1	Lipids: classification into neutral lipids, phospholipids, steroids, glycolipids, fatty acids (saturated and unsaturated), glycerol structure and triglycerides, phospholipids, importance of phospholipids in the structure of the biological membrane, glycolipids, steroids (cholesterol).
3	Enzymes: general characteristics, enzyme-substrate recognition, "key lock model" and "induced adaptation model", activation energy and transition state, Michelis and Menten kinetics, enzymatic activity modulation, enzymatic inhibition; Dosage of enzymatic activity; plasma enzymes; enzymes as markers of diseases, drugs as enzyme inhibitors.
2	Oxygen binding proteins. Myoglobin and hemoglobin: structure, function, and related pathologies.
2	Biological Membranes: structure of membranes, transport through membranes: simple and facilitated diffusion; active and passive transport. Endocytosis and exocytosis. Receptors and signalling transduction.
2	Oncogenesis and inflammation.
1	Bioenergetics: energy, metabolism, chemical reactions in the cell (endoergonic and exoergonic), ATP, electron transporters (NAD and FAD), redox reactions.
3	Carbohydrate metabolism: glycolysis, alcoholic and lactic fermentation, chorus cycle. Gluconeogenesis. Pentose phosphate pathway. Pyruvate decarboxylation, krebs cycle, shuttle systems for reducing equivalents, electron transport chain, oxidative phosphorylation, decoupling agents. glycogenosynthesis and glycogenolysis. Insulin and Glucagon; Diabetes.
2	Lipid metabolism: lipid metabolism, regulation of the release of fatty acids. Lipid catabolism: utilization of glycerol. Activation of fatty acids. Transport of activated fatty acids: carnitine system. Betaoxidation of saturated and unsaturated fatty acids, at equal and odd carbon number. lipogenesis. triglyceride metabolism. cholesterol metabolism. ketone bodies. Integration between carbohydrate and lipid metabolisms. Digestion and lipid absorption. Structure and function of lipoproteins. Atherosclerosis.
1	Metabolism of amino acids : essential and non-essential amino acids, catabolism of amino acids, transamination, ALT, AST, deamination, transdesamination, decarboxylation. metabolic fate of ammonia. Glutamate, glutamine. Urea cycle.

MODULE
MEDICAL GENETICS

Prof.ssa MARIA PICCIONE

SUGGESTED BIBLIOGRAPHY	
Giovanni Neri e Maurizio Genuardi Genetica umana e medica Editore: Masson-Edra 2014	
AMBIT	10338-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	30
COURSE ACTIVITY (Hrs)	20
EDUCATIONAL OBJECTIVES OF THE MODULE	
Basic knowledge of the main genetic, genomic, chromosomal and / or methylation pattern alteration syndromes. Knowledge of the natural history and follow-up programs of the syndromes studied for a global management and a person-centered habilitation / rehabilitation intervention.	

SYLLABUS

Hrs	Frontal teaching
20	Genetic test Chromosomal, genomic, genetic and epigenetic syndromes

MODULE
APPLIED BIOLOGY

Prof.ssa ROSARIA MARIA PIPITONE

SUGGESTED BIBLIOGRAPHY	
- P.Bonaudo, C.Crisafulli, R.D'Angelo, M.Francolini, S.Grimaudo, C.Rinaldi, P.Riva, M.G.Romanelli. Editore: EdiSES. ISBN9788833190389 - Helena Curtis, N Sue Barnes, Adriana Schnek, Alicia Massarini " Elementi di Biologia " Zanichelli, 2017 ISBN: 9788808773784- disponibile versione ebook.	
AMBIT	10338-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	30
COURSE ACTIVITY (Hrs)	20
EDUCATIONAL OBJECTIVES OF THE MODULE	
Understand the cellular organization that underlies living organisms. - To know the basic biological processes of molecular biology. - Understanding the processes of gene expression. - Understanding the mechanisms of cell division and sexual reproduction	

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the course: illustration of the objectives of the course, the methods of exams, the teaching material. Living organism concept. The cell: structural and functional organization. Differences between eukaryotic, prokaryotic cells and viruses
4	Chemical composition of living material; biological macromolecules; Proteins: structure and function. Biological membranes.
2	Nucleic acids: structure and function; DNA as genetic material; Main classes of RNA.
2	DNA duplication process in prokaryotes and eukaryotes.
2	Gene expression: Transcription and Maturation of primary transcripts in eukaryotes.
4	Genetic code; ribosome structure and protein synthesis: initiation, elongation and termination phases of translation.
2	Chromatin and Chromosomes; Cell cycle and Mitosis.
2	Meiosis and gametogenesis in humans. sexual reproduction; Elements of developmental biology.