



# UNIVERSITÀ DEGLI STUDI DI PALERMO

<b>DEPARTMENT</b>	Biomedicina, Neuroscienze e Diagnostica avanzata		
<b>ACADEMIC YEAR</b>	2022/2023		
<b>BACHELOR'S DEGREE (BSC)</b>	NEUROPHYSIOPATHOLOGY TECHNIQUES		
<b>INTEGRATED COURSE</b>	BIOLOGICAL AND MOLECULAR BASES OF LIFE		
<b>CODE</b>	22325		
<b>MODULES</b>	Yes		
<b>NUMBER OF MODULES</b>	3		
<b>SCIENTIFIC SECTOR(S)</b>	BIO/13, MED/03, BIO/10		
<b>HEAD PROFESSOR(S)</b>	LAURICELLA MARIANNA	Professore Ordinario	Univ. di PALERMO
<b>OTHER PROFESSOR(S)</b>	LAURICELLA MARIANNA	Professore Ordinario	Univ. di PALERMO
	DI BELLA MARIA	Ricercatore	Univ. di PALERMO
	ANTONIETTA		
	PICCIONE MARIA	Professore Associato	Univ. di PALERMO
<b>CREDITS</b>	6		
<b>PROPAEDEUTICAL SUBJECTS</b>			
<b>MUTUALIZATION</b>			
<b>YEAR</b>	1		
<b>TERM (SEMESTER)</b>	1° semester		
<b>ATTENDANCE</b>	Mandatory		
<b>EVALUATION</b>	Out of 30		
<b>TEACHER OFFICE HOURS</b>	<p><b>DI BELLA MARIA ANTONIETTA</b>            Tuesday 16:00 18:00 Dip. Biomedicina, Neuroscienze e Diagnostica avanzata-            Sezione di Biologia e Genetica Via Divisi,83 90133            Palermo</p> <p><b>LAURICELLA MARIANNA</b>            Monday 9:00 11:00 SEzione di Biochimica del BIND</p> <p><b>PICCIONE MARIA</b>            Friday 13:00 14:00 UOC Genetica Medica Ospedale Cervello via Trabucco 180            Palermo</p>		

DOCENTE: Prof.ssa MARIANNA LAURICELLA

<b>PREREQUISITES</b>	Knowledge of the basics of general chemistry and organic chemistry. Knowledge of the structure of the eukaryotic cell and its compartments.
<b>LEARNING OUTCOMES</b>	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
<b>ASSESSMENT METHODS</b>	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.
<b>TEACHING METHODS</b>	The course includes frontal lectures

**MODULE  
APPLIED BIOLOGY**

*Prof.ssa MARIA ANTONIETTA DI BELLA*

**SUGGESTED BIBLIOGRAPHY**

Capitoli scelti dal testo-De Leo, Ginelli, Fasano "Biologia e Genetica" EdiSes, ed 4a, 2020. ISBN9788836230013; disponibile versione ebook

Helena Curtis, N Sue Barnes, Adriana Schnek, Alicia Massarini "Elementi di Biologia" Zanichelli, 2017 ISBN: 9788808773784 disponibile versione ebook

Campbell "Biologia e Genetica" 12/Ed. Pearson, 2021; ISBN 9788891905567; disponibile versione digitale

<b>AMBIT</b>	10338-Scienze biomediche
<b>INDIVIDUAL STUDY (Hrs)</b>	30
<b>COURSE ACTIVITY (Hrs)</b>	20

**EDUCATIONAL OBJECTIVES OF THE MODULE**

To understand the cell structure and function that are the essence of life;  
To know the fundamental processes of molecular biology  
To Know the basic mechanisms of genetic expression  
To Know the process of cell division and sexual reproduction

**SYLLABUS**

Hrs	Frontal teaching
2	Living organisms, common fundamental properties. Internal organization of the cell. Similarities and differences between Eukaryotic, Prokaryotic cells, and Viruses
4	Cell chemistry and biological macromolecules; The structure and functions of Proteins; Cellular Membrane Structure
2	The structure and functions of nucleic acids; DNA as the genetic material; different types of RNA
2	DNA Replication
2	Expression of genetic information, Transcription; processing of mRNA in Eukaryotes
4	The genetic code; the ribosomes and the process of Translation: different steps in translation
2	Chromatin structure and Chromosomes; The Cell-Division Cycle and Mitosis
2	Meiosis, human Gametogenesis and Fertilization; elements of developmental biology

**MODULE  
MEDICAL GENETICS**

*Prof.ssa MARIA PICCIONE*

**SUGGESTED BIBLIOGRAPHY**

Giovanni Neri e Maurizio Genuardi  
Genetica umana e medica  
Editore: Masson-Edra 2014

<b>AMBIT</b>	10338-Scienze biomediche
<b>INDIVIDUAL STUDY (Hrs)</b>	30
<b>COURSE ACTIVITY (Hrs)</b>	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 BIOCHEMISTRY

*Prof.ssa MARIANNA LAURICELLA*

### 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

<b>AMBIT</b>	10338-Scienze biomediche
<b>INDIVIDUAL STUDY (Hrs)</b>	30
<b>COURSE ACTIVITY (Hrs)</b>	20

### EDUCATIONAL OBJECTIVES OF THE MODULE

We aims to provide the knowledge of the structure and function of biomolecules, the mode of action of enzymes, the basis of their regulation and catalysis, the basis of bioenergetics. We also aim to provide the knowledge of the molecular mechanisms of extracellular signal transduction, as well as the main metabolic processes and their regulation.

## SYLLABUS

Hrs	Frontal teaching
2	Chemical basis of life and biological molecules. Carboidrates. Lipids and proteins.
1	Proteins: Primary, secondary, supersecondary, tertiary and quaternary structure of proteins. Structural domains. Simple proteins and conjugated proteins (glycoproteins and proteoglycans) post-translational modifications of proteins.
2	Structure and composition of the biological membranes. Fluid mosaic model. Membrane transport. Osmosis. Simple and facilitated diffusion. Primary and secondary active transport.. Sodium-glucose simport. Sodium/potassium-dependent ATPase. Calcium-dependent ATPase. Other transport systems for calcium.
2	Signal transduction mechanisms. Membrane and cytosolic receptor classification. Adenylate cyclase System. Phosphoinositides System. Calcium/calmodulin Systems. Nitric oxide synthase (NOS). Membrane and cytosolic guanylate cyclase.
3	Enzymes: generalities. Mechanism of enzymatic catalysis. Active site. Specificity. Kinetic of Menten and Kinetic parameters ( $V_{max}$ and $K_m$ ). Enzyme inhibition. Allosteric enzymes. Enzyme inhibition mechanisms. Mechanisms for regulating enzymatic activity (gene induction, post-translational events, covalent modifications).
1	Cellular metabolism. Role of energy transporters in metabolism. ATP production mechanisms: oxidative phosphorylation and phosphorylation at the substrate level. Electron transport and respiratory chain complexes. ATP synthase.
3	Carbohydrate metabolism: Digestion and absorption of carbohydrates. Glycolysis, pentose phosphate pathway Glycogenolysis, Glycogenosynthesis and their regulation. Metabolic fate of pyruvate. The Krebs cycle. Gluconeogenesis.
3	Lipid metabolism: the metabolism of lipids, regulation of the release of fatty acids. Lipid catabolism: utilization of glycerol. Activation of acids fat. Transport of activated fatty acids: carnitine system. Beta-oxidation of saturated and unsaturated fatty acids, to the number of carbon atoms even and odd. lipogenesis. metabolism of triglycerides. cholesterol metabolism. chetonic bodies. Integration between carbohydrate and lipid metabolisms. Digestion and absorption of lipids. Structure and function of lipoproteins. Atherosclerosis (outline).
2	Amino acid metabolism: essential and non-essential amino acids, amino acid catabolism, transamination, ALT, AST, deamination, transdesamination, decarboxylation. metabolic fate of ammonia. Glutamate, glutamine. Urea cycle.
1	Hormones: general characteristics, classification and mechanism of action of hormones peptides, derived from amino acids and steroids; Insulin and Glucagon; Blood sugar regulation.