UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
BACHELOR'S DEGREE (BSC)	CHEMICAL AND BIOCHEMICAL ENGINEERING
SUBJECT	BIOCHEMISTRY
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	10657-Attività formative affini o integrative
CODE	08559
SCIENTIFIC SECTOR(S)	BIO/10
HEAD PROFESSOR(S)	GIULIANO MICHELA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**GIULIANO MICHELA** Monday 13:30 14:30 Studio personale, Plesso di Biochimica del Dipartimento STEBICEF, Edificio 15, Policlinico universitario, Via del Vespro, 129, piano terra Tuesday 13:30 14:30 Studio della docente, Plesso di Biochimica del Dipartimento STEBICEF, Policlinico universitario, Edificio 15, Via del Vespro, 129, piano terra Wednesday 13:30 14:30 Studio della docente, Plesso di Biochimica del Dipartimento STEBICEF, Policlinico universitario, Edificio 15, Via del Vespro, 129, piano terra Thursday 13:30 14:30 Studio della docente, Plesso di Biochimica del Dipartimento STEBICEF, Policlinico universitario, Edificio 15, Via del Vespro, 129, piano terra

DOCENTE: Prof.ssa MICHELA GIULIANO

PREREQUISITES	Rudiments of inorganic chemistry (chemical bonds, acids and bases, chemical reactions, solutions), Organic Chemistry (classes of organic compounds, functional groups and reactivity).
LEARNING OUTCOMES	Knowledge and understanding The course aims to: - provide basic knowledge on the structure of the eukaryotic and prokaryotic cells and on the functions of the subcellular organelles; - define the structure/ function relationship of the main biological macromolecules and the role in biological processes; - provide adequate knowledge on biological catalysts with particular attention to enzymatic kinetics and catalysis; - to describe the main pathways of aerobic and anaerobic metabolism. Ability to apply knowledge and understanding The course aims to make the student able to critically rework the acquired knowledge, finalizing the study to the understanding of molecular logic and its potential applications in the specific fields of interest of the course of study. Critical thinking Students are guided to critically learn everything that is explained and to improve their judgment skills through the study and discussion of wide-spread scientific problems Communication skills The course aims to help the studento to develop the ability to present the acquired knowledge in a clear and rigorous way. At the end of the course, the student must be able to state correctly and with appropriate vocabulary the definitions, problems and mechanisms acquired during the course. Learning skills The learning capacity will be monitored during the whole course, including through the interactions with the colleagues and the teacher during the lessons. The course aims to develop problematic learning skills with a critical approach.
ASSESSMENT METHODS	Written test, graded in /30, consisting of multiple choice tests and open-ended questions aimed to evaluating the basic knowledge and skills acquired, the ability to re-elaborate the concepts in an autonomous way and the proper use of the technical vocabulary. The written test may be integrated with an interview, at the request of the student, consisting of the discussion of the written test. The oral exam will involve a maximum variation of 3 points with respect to to the mark reported in the written test. The final evaluation, appropriately graduated, will be formulated on the basis of the following conditions: 18-24 /30 when the objectives achieved are satisfactory and the knowledge remains in the basic area, 25-27 /30 when the student demonstrates extensive understanding of the arguments and good grasp of vocabulary, 28-30 /30 (possibly cum laude) when the proficient student has full mastery of the cellular world and its main biochemical mechanisms and proves to be able to apply this knowledge in the field of biochemical and biotechnological engineering.
EDUCATIONAL OBJECTIVES	In line with the educational objectives of the CdL, the discipline aims to provide the student with: - basic knowledge of the "system" cell and its structure aimed at understanding the basics of life, energy and biosynthetic metabolism; - appropriate knowledge of the foundations of biochemistry needed to understand the role and applicability of biological agents in the main fields of interest for the biotechnology, food and chemical industries; - knowledge in the field of enzymatic catalysis and kinetics to understand the contents of the disciplines characterizing the CdL.
TEACHING METHODS	Lectures
SUGGESTED BIBLIOGRAPHY	NELSON & COX. INTRODUZIONE ALLA BIOCHIMICA DI LENHINGER. ZANICHELLI (6° ED.) ISBN: 9788808723284 PER CONSULTAZIONE G. PLOPPER PRINCIPI DI BIOLOGIA DELLA CELLULA, ZANICHELLI (1° ED.) ISBN: 9788808421289

SYLLABUS

Hrs	Frontal teaching
10	General introduction and presentation of the aims of the course. The prokaryotic and eukaryotic cell: structural generality and cellular organization. Structure and function of the biological membrane. Main subcellular organelles (mitochondrion, nucleus, endoplasmic reticulum, Golgi apparatus, ribosomes).
11	Biomolecules. Structure, properties and functions of amino acids and proteins, carbohydrates (monosaccharides disaccharides, polysaccharides), lipids, nucleotides and nucleic acids. Functional and chemical classification of amino acids. The proteins in the biological world. Structural levels of proteins and chemical bonds involved. The structure/function binomial in the cellular world. Protein domains. Protein folding. Oxygen binding proteins.

SYLLABUS

Hrs	Frontal teaching
10	Enzymes. Structure/function relationship. Recognition sites and catalytic sites. Enzymatic catalysis. Enzymatic kinetics. Michaelis-Menten equation and kinetic parameters (Vmax and Km). Enzyme inhibition. Allosteric enzymes. Cooperative kinetics and cooperative models. Regulation of enzymatic activity. Intercellular communication. Main signal transduction pathways. Properties of ligands and receptors.
6	Cellular metabolism. Anabolic and catabolic pathways. Bioenergetics. Role of energy transporters in metabolism. ATP production mechanisms: oxidative phosphorylation and phosphorylation at the substrate level. Transport of electrons and respiratory chain complexes.
14	Glucose metabolism: glycolysis, Krebs cycle, polysaccharides, pentose phosphate pathway. Overview on lipidic and amino acid metabolisms. Transamination and desamination reactions. Metabolism and transport of the ammonium ion. Synthesis of urea.
3	Metabolism of xenobiotics: general concepts and reactions of hydroxylations. Metabolism of reactive species