ACADEMIC YEAR 2023/2024

General information		
Academic subject	**BIOCHEMISTRY**	
Degree course	Science of Marine Productions and Resources (L38)	
Academic Year	I year	
European Credit Transfer and Accumulation System (ECTS)		8
Language	Italian	
Academic calendar (starting and ending date)	II semester	
Attendance	Frequency is recommended	

Professor/ Lecturer	
Name and Surname	Grazia Maria Liuzzi
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Department and address	Taranto presso Ex II Facoltà di Scienze MM.FF.NN, Via Alcide de Gasperi, (Quartiere Paolo VI) - 74123 Taranto
Virtual headquarters	Teams code for tutoring activity: 2o8ddc4
Tutoring (time and day)	Agree with the teacher by email

Syllabus	
Learning Objectives	The course of Biochemistry aims to provide the knowledge for understanding the molecular mechanisms that underlie cellular metabolic activities. In particular, the course will focus on the study of the structure and function of the main classes of biological macromolecules and the main processes that allow living organisms to obtain energy through the oxidation of molecules taken by the diet and to transform these molecules into their own constituents. During the lessons, the mechanisms of regulation of the main metabolic pathways will be discussed, in different pathophysiological conditions, with regard to carbohydrate, lipid and amino acid metabolism. This knowledge will be acquired through theoretical lessons.
Course prerequisites	In order to competently attend the course of Biochemistry students must have acquired in-depth knowledge of General Chemistry, Inorganic and Organic chemistry.
Contents	***First part*** **Molecular components of cells**: Bioelements. Biomolecules: chemical composition, characteristics, specialization and differentiation. Water: Structure and properties. Definition of pH and pK. Buffer systems. **Amino acids**: structures and properties, stereoisomerism, acid-basic properties and isoelectric point. **Protein structure and function**: primary structure; secondary structure: peptide bond, alpha helix and ß sheet structure; tertiary structure; quaternary structure. Denaturation. Classification of proteins. Oxygen transport molecules: myoglobin and hemoglobin: structure - function relationship; allosteric properties and cooperativity. Collagen: structure and biosynthesis. **Enzymes**: Classification, coenzymes, enzyme activity regulation. Kinetics of enzymatic reactions. Constant of Michaelis-Menten. Factors that influence enzyme activity. Reversible and irreversible enzymatic inhibition. Competitive, non-competitive and uncompetitive inhibition. Graphic methods for the identification of the nature of the inhibition and for the determination of Km, Vmax. Regulatory and allosteric enzymes.

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	Lipids: structure and function of fatty acids, triacylglycerols, membrane lipids and cholesterol. Biological membranes and transport. ***Second part*** **Bioenergetics and metabolism**: Standard free energy changes and equilibrium constant. Phosphate group transfer potential. Free-energy and redox potential. Glycolysis, pentose phosphate pathway and gluconeogenesis. Glycogen metabolism. Pyruvate dehydrogenase complex and its regulation. Krebs cycle. Fatty acid oxidation. Ketone bodies. Transamination and oxidative deamination. Urea cycle. Amino acid degradation. Respiratory chain and oxidative phosphorylation. Biosynthesis of lipids: fatty acids, triacylglycerols, membrane lipids, cholesterol. Gluconeogenesis and its regulation. Tissue-specific metabolism. **Hormones**, receptors and general mechanisms of signal transduction. Integration of metabolism and hormonal regulation.
Books and bibliography	1) D.C. Nelson e M.M. Cox I principi di biochimica di Lehninger., Ed. Zanichelli, Bologna. 2) D.C. Nelson e M.M. Cox Introduzione alla biochimica di Lehninger. Ed. Zanichelli, Bologna. 3) P. Riccio La biochimica essenziale. Ed. Laterza, Bari.
Additional materials	The texts are integrated with the slides of the lessons and the tutorials, distributed by the teacher during lessons and exercises.

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
200	***80***		***120***
ECTS			
8	***8***		

Teaching strategy	
	The course is structured in frontal theoretical lessons. The lessons take place in the classroom and the presentation takes place through the use of PowerPoint slides. During the lesson, discussion will be stimulated to provide both clarifications and further insights into the topic covered.
Expected learning outcomes	
Knowledge and understanding on:	At the end of the course the student will have acquired in-depth theoretical knowledge concerning the structure-function relationships of the main biological macromolecules and their transformations in anabolic and catabolic processes at the cellular level.
Applying knowledge and understanding on:	The student must be able to present or summarize in a complete but concise manner the notions acquired during the course using a correct technical language. The student must be able to transfer the notions learned to non-experts. The level of knowledge achieved, and the mastery of the fundamental concepts will be verified by discussing the topics under study during the oral exam.
Soft skills	**Knowledge and understanding** At the end of the course the student will have acquired in-depth theoretical knowledge concerning the structure-function relationships of the main biological macromolecules and their transformations in anabolic and catabolic processes at cellular level. **Autonomy of judgment**

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	At the end of the course the student will have to demonstrate the ability to critically analyze the information acquired regarding the homeostatic mechanisms that regulate the functioning of cell and the integration between organs and tissues. The achievement of this objective will be verified by the discussion during the oral exam. **Communication skills** At the end of the course, the student will have to demonstrate the ability to communicate clearly and effectively the fundamental principles and concepts of the topics studied using a technical terminology. The verification of these skills will be assessed based on the presentation methods shown during the oral exam. **Learning ability** The student will have to demonstrate that he/she has developed good skills in deepening his/her understanding of complex concepts that allow him to use the knowledge acquired during the biochemistry course in the subsequent teachings envisaged in the course of study. The level achieved in this capacity will be verified through the discussion of the exam topics.

Assessment and feedback	
Methods of assessment	The final exam includes an oral interview aimed at clearly ascertaining the learning of the topics covered during the Biochemistry course. An optional mid-term test based on multiple-choice quizzes on the topics covered in the first part of the course might be administered at the end of the first part of the course. This test constitutes a verification, useful for the student, of learning in the classroom and its outcome will be taken into consideration for the final evaluation. During the oral exam, the student will have to demonstrate an adequate knowledge of the main metabolic pathways and their regulation, with particular attention to the correlations between the different metabolic pathways studied. Will be evaluated: - the degree of detail of the topic, - the ability to describe molecular structures, - the ability to analyze metabolic pathways, highlighting their regulation and knowing how to make connections between the various topics. The clarity in the expression of the concepts exposed and the ability to use the appropriate terminology will be particularly appreciated. Regular attendance and the degree of active participation in the classroom will be elements of positive evaluation.
Evaluation criteria	**Knowledge and understanding** In the final exam, the student's ability to masterfully explain the fundamental concepts relating to the general and metabolic biochemical aspects and to the strategies for regulating the specific biochemical processes of the various tissues and organs and their integration and hormonal regulation will be evaluated. **Applying knowledge and understanding** In the final test, the critical ability developed by the student in exposing the fundamental concepts of the topics proposed during the course will be evaluated. **Communicating knowledge and understanding** The student's ability to use the appropriate terminology useful for correct and rigorous communication in the scientific field of the topics covered during the course will be evaluated. **Capacities to continue learning** The ability to deepen the concepts exposed during the biochemistry course will be evaluated since they will represent the basis for the acquisition of the skills foreseen by other courses in the context of the student's training. The level achieved in this capacity will be verified through the discussion of the exam topics.

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Criteria for assessment and attribution of the final mark	The final grade is expressed in 30th, where 18 represents the minimum and 30 the maximum The exam is considered passed when the grade is greater than or equal to 18. In the ongoing written test, if present, a score from 1 to 3 will be assigned to each question, depending on the difficulty of the question. The test will be passed if the student reaches a minimum score of 18. This score will be averaged with that obtained in the oral exam. The level of integration between the various contents of the course, the achievement by the student of an organic vision of the topics addressed, the expressive mastery and the property in the scientific language used during the oral interview will contribute to the achievement of a high evaluation.
Additional information	

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