ACADEMIC YEAR 2024/2025

Main information about teaching		
Course name	**BIOCHEMISTRY**	
Study course	Marine Production and Resources Sciences – (L38)	
Course year	1st year	
University training credits (CFU) / European Credit Transfer and Accumulation System (ECTS):/		8
SSD	BIO 10	
Language of delivery	Italian	
Time period	*2nd semester*	
Compulsory attendance	Optional but strongly recommended	

Teacher	
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Site	Taranto presso Ex II Facoltà di Scienze MM.FF.NN, Via Alcide de Gasperi, (Quartiere Paolo VI) - 74123 Taranto
Virtual site	
Reception (days, times and methods)	to be agreed

Syllabus	
Training objectives	Knowledge of the molecular mechanisms that underlie cellular activities. The objectives of the course are to learn: 1) of the chemical structure and function of the molecules that constitute living matter; 2) the principles of kinetics and enzymatic inhibition; 3) the principles of metabolic transformations of the main biomolecules; 4) energy transformation pathways; 5) the biochemical mechanisms underlying the processes of conservation and expression of genetic information. During the course the student is guided in understanding of the structure/function relationships of macromolecules. 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 oxidation-reduction processes involving the main cellular components. The mechanisms of regulation of the main metabolic pathways will be discussed, in different pathophysiological conditions, with particular attention to glucose, lipid and amino acid metabolism. This knowledge will be acquired through theoretical lessons.
Prerequisites	Basic knowledge of Biology, general and inorganic chemistry and organic chemistry

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Teaching contents (Programme)	Lipid metabolism. Activation and transfer of fatty acids into the mitochondria. ß-oxidation: reactions, enzymes, energy balance. Synthesis of fatty acids: formation of precursors of fatty acid synthesis: citrate lyase reactions. AcylCoA carboxylase and regulation. The fatty acid synthase complex. Reactions of saturated fatty acid biosynthesis and regulation. Differences between ß-oxidation and synthesis of fatty acids. Ketone bodies. Physiological significance of the formation of ketone bodies. Amino acid metabolism. Amino acid oxidation pathways. Transamination, decarboxylation, oxidative deamination. Glucose-alanine cycle. Formation of nitrogenous excretion products: the urea cycle. Balance and regulation of the urea cycle. Fate of the carbon skeleton of amino acids: glucogenic and ketogenic amino acids. Terminal metabolism. Krebs cycle: individual reactions and metabolic regulation; enzymes. Global reaction and energy yield; Anaplerotic reactions. Oxidation-reduction processes: redox potentials and free energy variations. Classes of enzymes that transfer electrons. The respiratory chain: components; substrates; inhibitors. Oxidative phosphorylation. Electronic transport in the respiratory chain. The coupling of phosphorylation to electron transport. Energy charge of ATP and phosphorylation potential. Mitochondrial carriers. The ADP/ATP carrier. Di- and tricarboxylic carriers, pyruvate carriers, phosphate carriers. Ornithine/citrulline carrier. Shuttle systems for the transport of NADH from the cytoplasm to the mitochondrion: malate-aspartate shuttle, glycerol-phosphate shuttle.
Reference texts	Nelson, Cox, I principi di biochimica di Lehninger, Zanichelli Voet, Voet, Pratt, Fondamenti di biochimica, Zanichelli J.M. Berg, J.L. Tymoczko, G.J. Gatto, L. Stryer, Biochimica, Zanichelli Denise R. Ferrier, Le basi della Biochimica, Zanichelli
Notes to reference texts	Texts are integrated with the lesson slides and with the exercise sheets, distributed by the teacher during the lessons and exercises

Organization of teaching			
Hours			
Total	Frontal teaching		Individual study
200	***64***		***136***
CFU/ETCS			
8	***8***		

Teaching methods	
	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 on the topic covered.

Expected learning outcomes	

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Knowledge and understanding	At the end of the course the student will have acquired in-depth knowledge regarding the structure-function relationships of the main biological macromolecules and their transformations in anabolic and catabolic processes at the cellular level.
Applied knowledge and understanding	The student must be able to completely present and/or summarize the notions acquired during the course using correct technical language and be able to evaluate and interpret the experimental data obtained during laboratory exercises. The level of knowledge achieved and the mastery of the fundamental concepts will be verified through the discussion of the topics being studied during the oral exam.
Transversal skills	

Assessment	
Learning assessment methods	The final exam includes an oral interview aimed at clearly ascertaining the learning of the topics covered during the Biochemistry course. During the oral interview the student will have to demonstrate adequate knowledge of the main metabolic pathways and their regulation, with particular attention to the correlations between the different metabolic pathways studied. Regular attendance and the degree of active participation in the classroom will be elements of positive evaluation.
Evaluation criteria	In the final test, the student's ability to master the fundamental concepts relating to general biochemical and metabolic aspects will be assessed.
Measurement criteria of learning and attribution of the final grade	The final mark will be awarded out of thirty, where 30 represents the maximum mark and 18 the minimum mark. The exam is considered passed when the grade is greater than or equal to 18.
Other	

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