ACADEMIC YEAR 2025/2026

General information	
Academic subject	**BIOCHEMISTRY**
Degree course	Bachelor's Degree in Production and Marine Resources Sciences
Academic Year	Iù year
European Credit Transfer and Accumulation System (ECTS)	8
Language	ITALIAN
Academic calendar (starting and ending date)	Ii semester
Attendance	Mandatory

Professor/ Lecturer	
Name and Surname	NICOLA PUGLIESE
E-mail	nicola.pugliese@uniba.it
Telephone	Tel. +390805713924
Department and address	Taranto presso Ex II Facoltà di Scienze MM.FF.NN, Via Alcide de Gasperi, (Quartiere Paolo VI) - 74123 Taranto
Virtual headquarters	Microsoft Teams, group "Biochimica - Scienze delle produzioni e delle risorse del mare", access code **rrexnik**
Tutoring (time and day)	In person and remotely: Monday 15:00–17:00; Wednesday 15:00–17:00 by appointment via e-mail

Syllabus	
Learning Objectives	At the end of the course the learner will be able to: ❖ Recall the fundamental physicochemical concepts and the general characteristics of the main biological macromolecules. ❖ State and explain the basic principles that govern the flow of energy and matter in cells and describe the main metabolic pathways and their role in cellular functions. ❖ Interpret general mechanisms of metabolic regulation and compare different metabolic states. ❖ Use basic biochemical concepts to analyze simple metabolic situations or problems and formulate plausible explanations for specific case studies.
Course prerequisites	Propedeuticity: Fundamentals of Chemistry. In addition, the learner should have basic knowledge of general and inorganic chemistry, organic chemistry, thermodynamics and cell structure, as well as fundamentals of mathematics.
Contents	The course belongs to the basic sciences area. • Introduction to biochemistry ○ Recall of organic chemistry: functional groups and their reactions. ○ Water: structure and properties. ○ Ionization, pH and buffer systems. • Structure of biological macromolecules ○ Carbohydrates: monosaccharides, disaccharides, polysaccharides and glycoconjugates. ○ Lipids: storage and structural lipids; lipids as signals, cofactors and pigments.

	○ Amino acids and protein structures. ○ Nucleotides and nucleic acid structure. • Enzymes ○ Enzyme kinetics. ○ Cofactors / coenzymes. ○ Regulation. • Introduction to cellular metabolism ○ Basic bioenergetic reactions. ○ Principles of thermodynamics. ○ Oxidative phosphorylation. ○ ATP hydrolysis. • Glucose metabolism ○ Glycolysis. ○ Citric acid (TCA) cycle. ○ Gluconeogenesis and the pentose phosphate pathway. ○ Glycogen breakdown and synthesis. • Fatty acid metabolism ○ Fatty acid catabolism (β-oxidation). ○ Ketone bodies. ○ Biosynthesis of triglycerides, membrane phospholipids, cholesterol and steroids. • Amino acid metabolism ○ Decarboxylation and deamination. ○ Oxidation and urea production. • Nucleotide metabolism. • The central dogma of molecular biology ○ Replication. ○ Transcription. ○ Translation. • Brief notes on photosynthesis and carbohydrate synthesis in plants.
Books and bibliography	D'Andrea G. – Biochimica Essenziale – EdiSES, 2017
Additional materials	The learner will integrate textbook study with lecture notes. The instructor will make the lecture slides available. Additional teaching material may be provided. Teaching material will be available in the General channel of the Teams group.
Biosafety rules for the attendance of practical activities.	No practical activities are planned.

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
200	***64***	***0***	***126***
ECTS			

U.O. Didattica e servizi agli studenti
Strada prov.le 62 per Casamassima, km. 3,00
70010 Valenzano (Bari) - Italy
Tel. (+39) 080 5713944-41-46
didattica.veterinaria@uniba.it

8	***8***	***0***	
Teaching strategy	The course will be mainly structured as lectures. Depending on the actual number of regularly attending learners, competency-based learning modules may be organized using Problem-Based Learning (PBL) or Team-Based Learning (TBL) methodologies.		
Expected learning outcomes			
Knowledge and understanding on:	At the end of the course, the learner will be able to: • Recall the fundamental physicochemical properties of water, the concept of pH, and the role of buffer systems. • Describe the structure, functional characteristics, and general biological roles of carbohydrates, lipids, proteins, and nucleic acids. • Explain the basic principles of enzyme kinetics. • Illustrate the fundamental concepts of bioenergetics and biochemical thermodynamics. • Present the essential characteristics of the main metabolic pathways: glycolysis, citric acid cycle, gluconeogenesis, pentose phosphate pathway, glycogen metabolism, β-oxidation and lipid biosynthesis, protein synthesis and amino acid degradation, urea cycle, respiratory chain and oxidative phosphorylation. • Describe the central dogma of molecular biology (replication, transcription, translation). • Recognize the general mechanisms of metabolic regulation and their functional significance.		
Applying knowledge and understanding on:	At the end of the course the learner will be able to: • Apply the terminology and schematic representation of reactions to read and interpret simplified metabolic maps. • Calculate and interpret simple kinetic and thermodynamic parameters. • Analyze qualitatively the effect of metabolic perturbations and predict possible consequences. • Connect and integrate different metabolic pathways to explain complex cellular responses. • Solve simple applied problems that require the combined use of concepts on enzymes, metabolic fluxes and bioenergetics to justify answers.		
Soft skills	*Knowledge and understanding* At the end of the course, the learner will be able to: • Evaluate informational elements to formulate reasoned conclusions on simple problems. • Analyze simple scenarios and identify alternative hypotheses or practicable solutions. • Justify their decisions during group activities, also weighing the limits of the available information. *Communication skills* At the end of the course, the learner will be able to: • Communicate clearly and correctly basic biochemical concepts using appropriate scientific terminology. • Collaborate effectively in a group by expressing one's point of view, listening to other members, negotiating and respecting roles to produce shared outputs. • Simplify and visualize complex information through concept maps, metabolic diagrams or summary tables.		

	Ability to learn autonomously At the end of the course, the learner will be able to: • Identify autonomously the cognitive gaps related to the course contents and define possible short-term learning objectives. • Search and select appropriate teaching sources, synthesizing their contents for personal and collective use. • Self-evaluate their learning by modifying study strategies based on feedback received from the instructor or colleagues and on the results obtained in formative assessments.

Assessment and feedback	
Methods of assessment	Learning assessment takes place through an oral examination, aimed at evaluating the achievement of the expected learning outcomes in terms of knowledge and competencies. In agreement with attending students, in-term written tests with formative or summative value may be scheduled. Modalities and timing for administering any in-term tests will be agreed with students, and the related evaluation grids will be made available prior to or at the time of the test. Without prejudice to compensatory tools and dispensatory measures for learners with Specific Learning Disorders (DSA) and with special educational needs, each learner has the right to take the oral examination as the only examination method; the choice not to participate in in-term tests will not result in any penalty to the final grade.
Evaluation criteria	*Knowledge and understanding (up to 9 points)* • Excellent (9 points): the learner recalls correctly and in detail the fundamental concepts; shows mastery of the programme content and synthesizes information coherently. • Distinguished (7–8 points): knowledge is solid, presented with rare and minor inaccuracies; main concepts are explained with appropriate examples. • Good (6 points): knowledge is adequate with some minor gaps; the learner explains key points not always with the same depth of detail. • Sufficient (4–5 points): the learner remembers the essential elements but with relevant inaccuracies or omissions; explanations are simple and sometimes confused. • Insufficient (1–3 points): failure to acquire fundamental concepts; incomplete or incorrect answers. *Applied knowledge and problem solving (up to 9 points)* • Excellent (9 points): the learner solves the proposed problems with rigor; performs correct calculations and interpretations, showing a systematic approach. • Distinguished (7–8 points): the learner shows good applied skills with occasional detailed errors that do not compromise the overall solution. • Good (6 points): the learner knows how to apply concepts to solve simple problems; in the presence of more complex cases tends to simplify and may make errors. • Sufficient (4–5 points): the learner applies concepts in an elementary way and does not always recognize the practical implications of a metabolic variation. • Insufficient (1–3 points): inability to apply concepts, showing a disorganized approach.

U.O. Didattica e servizi agli studenti
Strada prov.le 62 per Casamassima, km. 3,00
70010 Valenzano (Bari) - Italy
Tel. (+39) 080 5713944-41-46
didattica.veterinaria@uniba.it

	Integration and autonomy of judgment (up to 6 points) • Excellent (6 points): The learner integrates metabolic pathways and data in an original way, critically evaluating alternatives and justifying choices with solid arguments. • Distinguished (5 points): Integration capability is good and choices are motivated. The learner identifies limits and defines hypotheses. • Good (4 points): The learner is able to integrate the main processes with difficulty, providing correct but simple judgments. • Sufficient (3 points): The learner shows limited integration ability with generic justifications. • Insufficient (1–2 points): the learner fails to integrate information and lacks autonomy of judgment. *Communication skills and clarity of exposition (up to 6 points)* • Excellent (6 points): the learner presents in a clear, logical and concise manner; uses maps or diagrams effectively, manages time correctly and uses exact and appropriate lexicon and terminology for the context. • Distinguished (5 points): The discourse is well organized and the terminology appropriate; the learner shows some hesitation. • Good (4 points): the exposition is overall comprehensible, but the learner lacks synthesis and ideas are sometimes discontinuous. • Sufficient (3 points): communication is not linear, with difficulty summarizing and using technical-scientific terminology appropriately. • Insufficient (1–2 points): communication is confused and terminology incorrect or inappropriate.
Criteria for assessment and attribution of the final mark	The final grade is expressed in thirtieths. The exam is considered passed when the grade is greater than or equal to 18/30. An essential requirement for passing the exam is knowledge of all the metabolic pathways covered during the course. The correct use of scientific terminology, the ability to correlate the various metabolic pathways, as well as the ability to organize a discourse ranging and correlating the different acquired concepts, will contribute to increasing the final grade. Active participation in competency-based learning activities will be a criterion for evaluation and for the assignment of bonus points.
Additional information	

U.O. Didattica e servizi agli studenti
Strada prov.le 62 per Casamassima, km. 3,00
70010 Valenzano (Bari) - Italy
Tel. (+39) 080 5713944-41-46
didattica.veterinaria@uniba.it