

COURSE OF STUDY **Agricultural Sciences and Technologies (L-25) Curriculum Plant Production and Crop Protection (PPCP)**

ACADEMIC YEAR 2023-2024

ACADEMIC SUBJECT Agricultural Biochemistry (6 ECTS) (I.C. Agricultural Biochemistry, Plant Physiology, and Biology of Microorganisms)

General information	
Year of the course	Second
Academic calendar (starting and ending date)	February 26, 2024 - June 14, 2024
Credits (CFU/ETCS):	6
SSD	AGR/13 – Agricultural chemistry
Language	Italian
Mode of attendance	Optional

Professor/ Lecturer	
Name and Surname	Valeria D’Orazio
E-mail	valeria.dorazio@uniba.it
Telephone	+ 39 080 544 3166
Department and address	Campus di Via E. Orabona, 4 – Plexus of Agriculture - Dept. of Soil, Plant and Food Sciences (DISSPA) – Division of Chemistry and Biochemistry; floor 1, room 6.
Virtual room	Teams’ platform, team code: q6pwp97
Office Hours (and modalities: e.g., by appointment, online, etc.)	From Monday to Friday, at the teacher's office and / or on the Teams platform, by appointment to be agreed by e-mail

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
150	32	28	90
CFU/ETCS			
6	4	2	

Learning Objectives	The course aims to provide students with the key to understanding the chemical and biological context in which the molecules, reactions and metabolic pathways underlying the life cycle of plants are framed.
Course prerequisites	Basic knowledge of General and Organic Chemistry and Plant Biology

Teaching strategy	Lectures will be held with Power Point slides help, practical using the blackboard with the involvement of students
Expected learning outcomes in terms of	
Knowledge and understanding on:	<ul style="list-style-type: none"> Students will acquire knowledge of the main chemical and structural characteristics of biomolecules in relation to their role in cell metabolism; they will analyze the properties and functions of enzymes and their regulation, bioenergetics and trans-membrane transport, the metabolic pathways and their regulation

Applying knowledge and understanding on:	<ul style="list-style-type: none"> ○ The skills acquired through the course are the bases necessary for understanding the chemical changes that organic matter undergoes in living organisms and the relationships between these changes and the qualitative, quantitative and technological aspects of agricultural production
Soft skills	<ul style="list-style-type: none"> ● <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ Students will be able to evaluate independently the importance of the chemical characteristics of biomolecules for the functioning of the main metabolic processes in living organisms ● <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Ability to communicate with entrepreneurs and production technicians, with responsible for public and private agencies, encourage coordination between technical areas of production; present the results of projects and works developed independently and/or in group activity, by means of technical reports ● <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Expected learning results, in terms of knowledge and skill, are reported in the Attachment A of the Learning Regulation of the Bachelor's Degree in Agricultural Sciences and Technology (stated by the European descriptors of the educational qualification; field of agricultural sciences)
Syllabus	
Content knowledge	<p>Bioenergetics principles. Energy transfer. Transfer of phosphoric groups and ATP cycle. Electron transporters, structure and biochemical role. Red-ox reactions. Reduction potential.</p> <p>Biological macromolecules: carbohydrates, lipids, proteins, polynucleotides. Modeling of macromolecules. Electrophoresis.</p> <p>Biochemical transformations and enzymatic catalysis. Specificity of enzymes. Enzymatic and kinetic activity. Factors that influence the activity of enzymes. Enzymatic inhibition and regulation. Spectroscopy. Direct and indirect methods. Enzymatic dosage.</p> <p>Primary carbon metabolism. Glycolysis. Oxidative decarboxylation. Tricarboxylic acid cycle. Respiratory chain and oxidative phosphorylation. Via the pentose-phosphate.</p> <p>Lipid metabolism. β-oxidation of fatty acids. Glyoxylate cycle. Nitrogen metabolism. Catabolism of amino acids. Urea cycle in plants. Photosynthesis. Chemistry and physiology of photosynthetic pigments. Photosynthetic unit and photosystems. Photosynthetic electron transport and photo-phosphorylation. Photosynthetic assimilation of carbon: C3 cycle, photo-respiration, C4 cycle, CAM plants.</p>
Texts and readings	D. L. Nelson, M. M. Cox, Introduzione alla biochimica di Lehninger, Zanichelli, 6 edizione, 2018;
Notes, additional materials	<ul style="list-style-type: none"> ● Lecture notes; ● Taiz L., Zeiger E. "Fisiologia Vegetale", Piccin Editore, Padova. Ed 2009
Repository	The texts are available at the Central Agricultural Library and at the studio of the professor in charge of the course
Assessment	
Assessment methods	The evaluation of the student skill is based on pre-defined parameters, as reported in the Attachment A of the Learning Regulation of the Bachelor's degree in Agricultural Sciences and Technology. The exam consists of an oral test with questions related to the programme, as reported on the Learning Regulation of the Bachelor's degree in Agricultural Sciences and Technology and on the study plan (Attachment A). A discretionary mid term oral test, valid throughout the entire year, providing only the admission to the final exam, is

	scheduled for all students attending the regular year's course. The evaluation of the final exam will take into account the performance of the mid term test and will be expressed in thirtieths
Assessment criteria	<ul style="list-style-type: none"> • <i>Knowledge and understanding</i> <ul style="list-style-type: none"> ○ The student will have to know the main chemical and structural characteristics of biomolecules in relation to their role in cell metabolism; the properties and functions of enzymes and their regulation, bioenergetics and trans-membrane transport, the metabolic pathways and their regulation • <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> ○ The student will have to know the chemical changes that organic matter undergoes in living organisms and the relationships between these changes and the qualitative, quantitative and technological aspects of agricultural production. • <i>Autonomy of judgment</i> <ul style="list-style-type: none"> ○ The student must be able to evaluate independently the importance of the chemical characteristics of biomolecules for the functioning of the main metabolic processes in living organisms. • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ The student must be able to communicate with entrepreneurs and production technicians, with responsible for public and private agencies; to encourage coordination between technical areas of production; to present the results of projects and works developed independently and/or in group activity, by means of technical reports. • <i>Communication skills</i> <ul style="list-style-type: none"> ○ Ability to compare their knowledge with colleagues in the field of agricultural biochemistry • <i>Capacities to continue learning</i> <p>The student must demonstrate that he has learned, in terms of knowledge and skill, what has been reported in the Attachment A of the Learning Regulation of the Bachelor's Degree in Agricultural Sciences and Technology (stated by the European descriptors of the educational qualification; field of agricultural sciences)</p>
Final exam and grading criteria	The final grade is awarded out of thirty. The exam is passed when the grade is greater than or equal to 18. The final mark is attributed also considering the evaluations of the two modules that are part of the I.C.
Further information	
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