

COURSE OF STUDY: Agricultural Sciences and Technologies

ACADEMIC YEAR: 2023-2024

ACADEMIC SUBJECT Agricultural Biochemistry and Plant Nutrition (6 ETCS) -
module of I.C. Plant Biochemistry and Biology of Microorganisms

General information	
Year of the course	<i>Second Year</i>
Academic calendar (starting and ending date)	February 26 th 2024 - June 14 th 2024 (Pause April 22 nd – May 3 rd 2023, for midterm exam)
Credits (CFU/ETCS):	3
SSD	<i>Agricultural Chemistry (AGR13)</i>
Language	<i>Italian</i>
Mode of attendance	No mandatory

Professor/ Lecturer	
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Department and address	Department of Soil, Plant and Food Sciences – Chemistry and Biochemistry Section, First floor room n. 9
Virtual room	Microsoft Teams code: rmc7o1s
Office Hours (and modalities: e.g., by appointment, on line, etc.)	From Monday to Friday, 9.00 a.m. to 1.30 p.m., following an established appointment requested by phone, e-mail or Teams.

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
150	40	14	96
CFU/ETCS			
6	5	1	

Learning Objectives	<i>The aim of the course is to understand how a whole inanimate molecules as components of living organisms inside complex structures interact to maintain and perpetuate the living state. The course is based on chemical and physico-chemical principles involving also the molecular aspects of physiology and biology. The knowledge of the fundamental components for plant life: membranes, energy and metabolism and the the role of essential elements for plant nutrition.</i>
Course prerequisites	Basic knowledge of general and organic chemistry, plant biology and soil chemistry.

Teaching strategies	<i>Oral presentation supported by Power Point slides, web sites and multimedia, by using the blackboard, documents prepared by the teacher, practical exercises in classroom and in laboratory.</i>
Expected learning outcomes in terms of	
Knowledge and understanding	○ Understanding and learning about essential elements and processes

<p>on:</p>	<p>at the basis of plant life</p> <ul style="list-style-type: none"> ○ Understanding the importance of metabolisms and energy transformations in plants and the environment. ○ Understanding the role of primary sources (atmosphere, water and soil) for plant nutrition and life.
<p>Applying knowledge and understanding on:</p>	<ul style="list-style-type: none"> ○ Applying the knowledge to the choice of the best cultivation strategies and soil fertilization practices.
<p>Soft skills</p>	<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ Independent understanding and elaboration of complex problems and solutions within issues related to agricultural productions. • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Communicating skills to appropriately discuss with production technicians and product managers on sound scientific basis as well as with representatives of public and private institutions ○ Ability to coordinate different technical areas in agricultural productions. ○ Reporting and disseminating knowledge and the results of projects and activities developed independently or within working groups. • <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Independency in acquiring and developing new knowledge and technical skills. ○ Ability to learn how to face and solve problems and to develop skills at the basis of agricultural productions and plant protection. ○ Getting the basic methodological and theoretical skills necessary to continue the formation with master studies in Agricultural and Food Sciences.
<p>Syllabus</p>	
<p>Content knowledge</p>	<ul style="list-style-type: none"> • <i>Biomolecules: carbohydrates, aminoacids, proteins, lipids, nucleic acids.</i> • <i>Enzymes: classification, principles, kinetics.</i> • <i>Biological membranes: composition, structure, properties, transporters.</i> • <i>Bioenergetics: high energy molecules, principles and mechanisms of energy fluxes in cells.</i> • <i>Primary metabolisms: photosynthesis, respiration.</i> • <i>Water and water balance in plants: the importance of water and its transport in soil and plant.</i> • <i>Mineral nutrition of plants: essential elements and mechanisms of acquisition and assimilation.</i> • <i>Translocation of nutrients in xylem.</i>
<p>Texts and readings</p>	<ul style="list-style-type: none"> • <i>Taiz L., Zeiger E. "Plant Physiology", Sinauer Associates Inc., U.S.A.</i> • <i>D. L. Nelson, M. M. Cox "Lehninger's Principles of Biochemistry", Macmillan Editor.</i>
<p>Notes, additional materials</p>	<p><i>Additional learning tools</i></p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=pwymX2LxnQs&list=PLevMI9xfLH7NCKlG72zZoCRk5UDslnUkB&index=3 • https://www.youtube.com/watch?v=kXpzp4RDGJI&list=PLevMI9xfLH7NCKlG72zZoCRk5UDslnUkB&index=2 • https://www.youtube.com/watch?v=hDq1rhUKV-g&list=PLevMI9xfLH7NCKlG72zZoCRk5UDslnUkB&index=10 • https://www.youtube.com/watch?v=x1ptpjvmsGY&list=PLevMI9xfLH7NCKlG72zZoCRk5UDslnUkB&index=1/

Repository	<i>The teaching material is available in the Microsoft Teams Class: Chemistry and Biochemistry of Plant Protection Products 2023/24 (teams code rnc7o1s)</i>
Assessment	
Assessment methods	<p>A mid-term exam will be held for active students (students enrolled in the academic year during which this discipline is offered). It will be an oral exam. The result of this mid-term exam will be valid for the whole academic year.</p> <p>The mid-term exam will be given on the subjects treated during the lessons and the practical activities as reported in the Didactic Regulation of the course (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>At the end of teaching period, students who passed positively the mid-term exam, can give the final exam on the subjects treated after the mid-term break, as reported in the Didactic Regulation of the Course (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>Students who did not pass or give the mid-term exam will be examined on the whole subjects treated during the lessons and the practical activities as reported in the Didactic Regulation of the course (art. 9) and syllabus (annex A) and which is correlated to the actual teaching period.</p> <p>The mid-term and the final exams consist of an oral test. The exam for foreign students can be given in English according to the above reported modalities.</p>
Assessment criteria	<ul style="list-style-type: none"> • <i>Knowledge and understanding</i> <ul style="list-style-type: none"> ○ Knowledge about essential elements and processes at the basis of plant life ○ Knowledge of metabolisms and energy transformations in plants and the environment. ○ Knowledge of the role of primary sources (atmosphere, water and soil) for plant nutrition and life, and of the mechanisms through which plants acquire and assimilate nutrients. • <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> ○ Ability to use the basic knowledge to solve problems related to soil fertility and plant production. • <i>Autonomy of judgment</i> <ul style="list-style-type: none"> ○ Ability to autonomously and critically understand and solve complex problems for agricultural production. • <i>Communication skills</i> <ul style="list-style-type: none"> ○ Ability to express the acquired knowledge in scientific and pertinent language • <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Ability to use cognitive tools such as the information technology (IT) and the English language for the continuing self-education
Final exam and grading criteria	<p>The final mark will consider the theoretical and practical knowledge acquired, the ability to apply the knowledge, autonomy of judgment, communication skills and on the ability to integrate the acquired knowledge in a project work. The evaluation of the student is based on criteria previously fixed such as reported in the Annex A of the Didactic Regulation of the Course.</p> <p>The final mark is awarded in thirtieths. The exam is passed when the mark is greater than or equal to 18.</p>
Further information	
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