UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2021/2022
BACHELOR'S DEGREE (BSC)	BIOLOGICAL SCIENCES
SUBJECT	PLANT PHYSIOLOGY WITH PRACTICE
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50027-Discipline biomolecolari
CODE	03386
SCIENTIFIC SECTOR(S)	BIO/04
HEAD PROFESSOR(S)	SALMERI CRISTINA MARIA BERNARDINA — Professore Associato — Univ. di PALERMO ODDO ELISABETTA — Ricercatore — Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**ODDO ELISABETTA** Tuesday 12:00 16:00 Via Archirafi 20, 5° piano. Giorno e orario sono solo indicativi, e possibile prendere apuntamento via mail per un ricevimento in altro momento. **SALMERI CRISTINA MARIA BERNARDINA** Tuesday 11:00 13:00 Via Archirafi 38 1° piano, previa prenotazione tramite portale o email docente Wednesday 9:00 10:30 Via Archirafi 38 1° piano, previa prenotazione tramite portale o email docente Thursday 11:00 12:30 Via Archirafi 38 1° piano, previa prenotazione tramite portale o email docente

DOCENTE: Prof.ssa CRISTINA MARIA BERNARDINA SALMERI- *Lettere L-Z*

PREREQUISITES	General and systematic botany. Chemistry. Physics.
LEARNING OUTCOMES	Knowledge and learning outcomes An understanding of the physiological mechanisms that regulate plant life. Lab experiments will help students understand these processes and develop some simple laboratory skills. Ability to apply knowledge and comprehension skills Students will develop the ability to use their basic knowledge of plant biology, chemistry and physics to understand the structure-function relation at the cell, organ and whole-plant level. They will be able to evaluate and comprehend the effects of the environment on plant growth. Independent judgement Ability to follow a rigorous scientific method to understand metabolic processes in plants and their relation to the environment. Evaluation and interpretation of laboratory experimental data. General notions on safety in the laboratory. Communication skills Ability to discuss biological subjects using appropriate scientific language. Ability to work in group, exchanging ideas and practical information. Ability to elaborate and present experimental data. Learning ability Students will learn to update their scientific knowledge in the field of plant biology. Lab practicals will aid in learning how to carry out experimental work and compare theories and hypotheses with experimental data.
ASSESSMENT METHODS	The achievement of the course learning outcomes will be assessed by: - a mid-term optional written test on the topics presented in the first part of the course (1 credit). The test consists of 12 multiple choice questions and 1open ended question, and must be completed in 1 hour. The multiple choice answers will be scored 2 points if correct, 0 points if wrong. The open ended answer will be scored from 0 to 6 points. The threshold to pass the test is 18/30. Students have the option to refuse the result of the test before the final exam. The score of the mid-term test contributes 20% to the final exam. - a final oral exam consisting in a talk aimed at demonstrating knowledge and understanding of the program topics (including lab practicals), ability to analyze and combine information obtained from the course, verbal communication skills and use of appropriate scientific terminology. The student will be asked to answer a minimum of three questions. The sufficiency threshold (18/30) will be met by demonstrating to the examination board at least a general knowledge and understanding of the subjects and basic communication skills. Rating will increase (up to 30/30 cum laude) with increasing ability and detail in explaining and discussing the topics related to the subject.
EDUCATIONAL OBJECTIVES	To provide a basic understanding of how plants function. Topics include the capture of light energy for growth and metabolism, water relations, plant nutrition, transport processes, plant development and its control by phytohormones, and responses to environmental stresses. Laboratory practicals reinforce these concepts and provide practical experience in plant physiology.
TEACHING METHODS	Lectures and Lab practicals
SUGGESTED BIBLIOGRAPHY	Rascio, Carfagna, Esposito, La Rocca, Lo Gullo, Trifilò,Trost, Vona. (2021) "Elementi di Fisiologia Vegetale" III edizione. EdiSES, Napoli. ISBN: 9788836230426 Da consultazione [To consult] : Taiz, Zeiger, Moller, Murphy (2016) "Elementi di Fisiologia Vegetale". II Edizione. Piccin, Padova ISBN: 8829927872 Taiz, Zeiger, Moller, Murphy (2018) "Fundamentals of Plant Physiology". 18th Ed. Oxford University Press. ISBN: 1605357901 Sacchetti, Paganetto (2021) "Biotecnologie delle piante medicinali" (Capitolo 4, Colture in vitro di cellule e tessuti). UTET. ISBN: 9788860086426

SYLLABUS

Hrs	Frontal teaching
5	Water relations. Water potential and its components. Water and solute flow between a cell and its environment.
6	Transport. Transport pathways in the plant. Water in the soil. Water transport in the xylem. Resistance and hydraulic conductance to water flow. Cavitation. Transpiration. Transport of sugars in the phloem. Source and sink organs. Phloem loading and unloading.
6	Mineral nutrition. Essential elements and nutrient stress. Nutrient assimilation. The contribution of symbioses to plant mineral nutrition.
9	Main experiments in the history of the discovery of photosynthesis. Photosynthetic pigments. The light reactions; synthesis of ATP and NADPH. Carbon organication: the Calvin-Benson cycle. Photorespiration. Mechanisms for the concentration of CO2: C4 and CAM plants. Synthesis of sucrose and starch.

SYLLABUS

Hrs	Frontal teaching
4	Light as an environmental signal. Photomorphogenetic pigments: pphototropins and phytochromes. Phytochrome dependent responses. Photoperiodism. Blue light responses.
6	Plant hormones: discovery, structure, metabolism and the main physiological effects of auxin, gibberellins, cytokinins, ethylene and abscissic acid.
2	Movements in plants: nutation, tropic and nastic movements.
1	Plant biotechnology: in vitro cultures, genetical modification and transformation techniques.

Hrs	Practice
4	Methods to measure plant water relations. Tissue water potential measurement with the gravimetric method
4	Techniques to measure plant gas exchange and photosynthetic pigment content. Extraction and spectrophotometric assay of chlorophylls and carotenoids. Chlorophyll fluorescence
4	Plant tissue culture: techniques and uses. Preparation of culture media, sterilization and in vitro transfer of plant material.

DOCENTE: Prof.ssa ELISABETTA ODDO- *Lettere A-K*

PREREQUISITES	General and systematic botany. Chemistry. Physics.
LEARNING OUTCOMES	Knowledge and learning outcomes An understanding of the physiological mechanisms that regulate plant life. Lab experiments will help students understand these processes and develop some simple laboratory skills. Ability to apply knowledge and comprehension skills Students will develop the ability to use their basic knowledge of plant biology, chemistry and physics to understand the structure-function relation at the cell, organ and whole-plant level. They will be able to evaluate and comprehend the effects of the environment on plant growth. Independent judgement Ability to follow a rigorous scientific method to understand metabolic processes in plants and their relation to the environment. Evaluation and interpretation of laboratory experimental data. General notions on safety in the laboratory. Communication skills Ability to discuss biological subjects using appropriate scientific language. Ability to work in group, exchanging ideas and practical information. Ability to elaborate and present experimental data. Learning ability Students will learn to update their scientific knowledge in the field of plant biology. Lab practicals will aid in learning how to carry out experimental work and compare theories and hypotheses with experimental data.
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SYLLABUS

Hrs	Frontal teaching
1	Introduction to the course. Definition and common features of plant organisms. Model systems in plant physiology.
5	Water relations. Water potential and its components. Water and solute flow between a cell and its environment.
6	Transport. Transport pathways in the plant. Water in the soil. Water transport in the xylem. Resistance and hydraulic conductance to water flow. Cavitation. Transpiration. Transport of sugars in the phloem. Source and sink organs. Phloem loading and unloading.
6	Mineral nutrition. Essential elements and nutrient stress. Nutrient assimilation. The contribution of symbioses to plant mineral nutrition.
9	Main experiments in the history of the discovery of photosynthesis. Photosynthetic pigments. The light reactions; synthesis of ATP and NADPH. Carbon organication: the Calvin-Benson cycle. Photorespiration. Mechanisms for the concentration of CO2: C4 and CAM plants. Synthesis of sucrose and starch.

SYLLABUS

Hrs	Frontal teaching
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