UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche		
ACADEMIC YEAR	2023/2024		
MASTER'S DEGREE (MSC)	BIODIVERSITY AND ENVIRONMENTAL BIOLOGY		
INTEGRATED COURSE	ADAPTIVE STRATEGIES OF PLANTS - INTEGRATED COURSE		
CODE	23319		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	BIO/02, BIO/04		
HEAD PROFESSOR(S)	ODDO ELISABETTA	Ricercatore	Univ. di PALERMO
OTHER PROFESSOR(S)	ODDO ELISABETTA TROIA ANGELO	Ricercatore Ricercatore a tempo determinato	Univ. di PALERMO Univ. di PALERMO
CREDITS	9		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
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. **TROIA ANGELO** Monday 15:00 17:00 Sede del Consorzio Universitario, corso Vittorio Emanuele, 92, 93100 Caltanissetta Tuesday 10:00 12:00 Dipartimento STEBICEF, via Archirafi 20, V piano (previo appuntamento). - NB: Il docente e' pienamente disponibile a concordare giorni od orari diversi da quello specificato, sempre previo appuntamento (per appuntamento, scrivere a: angelo.troia@unipa.it)		

DOCENTE: Prof.ssa ELISABETTA ODDO

PREREQUISITES	Basic knowledge of general and systematic botany. Basic knowledge of plant physiology.
LEARNING OUTCOMES	Knowledge and understanding: Comprehension of the main evolutionary processes of land plants (Embryophyta). Advanced knowledge in the field of plant adaptation strategies, allowing the evaluation of plant adaptation strategies related to environmental changes and stress. Understanding of the functional relations between physiological adaptation and environmental stress factors. Field and lab practicals will aid students in the comprehension of these processes. Applying knowledge and understanding: Students will be able to apply knowledge of plant species and populations for conservation and research purposes. They will be able to evaluate and understand negative and positive impacts of certain activities or environmental disturbances on plants. They will be able to evaluate the tolerance of plant species and the relevance of physiological adaptation and acclimation to stresses due to local and global climate change. Making judgements; Capacity to follow rigorous scientific methods to understand evolution. Evaluation and interpretation of different hypotheses. Ability to evaluate autonomously different approaches in plant ecophysiology. Interpret the physiological factors regulating the interactions between plants and the environment, with particular reference to the Mediterranean ecosystems. Communication skills: Capacity to communicate clearly and unambiguously about topics of evolutionary biology and about the complex interactions between physiological processes and environmental factors, using appropriate scientific language. Ability to work in team, exchanging ideas and practical information. Learning skills: Students will achieve the ability to critically interpret information in textbooks and lectures. They will learn to update personal knowledge by consulting databases and scientific papers in English regarding plant evolutionary biology and stress ecophysiology. Practicals will aid in learning how to conduct research activities in the field and in the laboratory.
ASSESSMENT METHODS	A final oral exam consisting in a talk aimed at demonstrating knowledge and understanding of the program topics (including practicals). The exam will be based on a minimum of three main questions per module. Further questions will aid in assessing the ability to analyze and combine information obtained from the course, verbal communication skills and use of appropriate scientific terminology. Grades vary from 18/30 to 30/30. Rating will increase with increasing ability and detail in explaining and discussing the topics related to the subject.
TEACHING METHODS	Lectures in class; experimental active learning sessions; practical activities in the lab and in the field.

MODULE
EVOLUTION AND ADAPTATION

Prof. ANGELO TROIA

SUGGESTED BIBLIOGRAPHY

Judd W.S. et al. (2019) Botanica Sistematica - Un approccio filogenetico. 3a ed. italiana. Piccin editore.
Cruzan, M. B. (2018). Evolutionary Biology: A Plant Perspective. United States of America: Oxford University Press.
Thompson, J. D. (2020). Plant Evolution in the Mediterranean: Insights for Conservation. UK: OUP Oxford.

Pubblicazioni scientifiche fornite dal docente durante il corso e disponibili sul portale.
Scientific papers distributed during the course and available on line at the University portal.

AMBIT	50506-Discipline del settore biodiversità e ambiente
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

To provide a basic knowledge of the main evolutionary processes that have affected terrestrial plants (Embryophyta), starting from their ancestors, and of the adaptations that the plants themselves have had/were able to develop during evolution. Field and laboratory activities complement these concepts and provide hands-on experience.

SYLLABUS

Hrs	Frontal teaching
4	Introduction to the course. Evolution and adaptation of land plants from their ancestors
4	Diversification of land plants: main groups from charophytes to angiosperms
4	CO2 concentration changes over time and their effects on photosynthesis
4	Concept of species, infraspecific variability and modality of speciation in plants
4	Ontogenetic cycles and reproduction
4	Hybrids and hybridization
4	Adaptations to extreme environments: the case of halophilic environments
4	Adaptations to disturbed environments: fires in the Mediterranean environment
4	Evolution in the aquatic environment
4	Evolution & islands

Hrs	Practice
8	Practice consists of practical activities carried out in the field on the following topics: recognition and examples of habitats, species and adaptive solutions.

Hrs	Workshops
4	Practice consists of practical activities carried out in the laboratory on the following topics: measurement of functional traits.

MODULE
ECO-PHYSIOLOGY OF STRESS

Prof.ssa ELISABETTA ODDO

SUGGESTED BIBLIOGRAPHY

Sanità di Toppi et al. - Interazioni Piante-Ambiente - 2018 - Piccin ISBN 978-88-299-2870-5
Taiz, Zeiger – Fisiologia Vegetale – 2012 - Piccin ISBN 978-88-299-2157-7
Pignatti – Ecologia Vegetale –1995 - UTET ISBN 8802046700
Taiz, Zeiger 2012. Plant Physiology. 5th Ed (or 3th Ed.) Sinauer Associates. ISBN: 978-0878938667

Da consultazione:
Larcher – Physiological Plant Ecology – 2003 - Springer
Lambers - Plant Physiological Ecology - 2008 - Springer
Nobel - Physicochemical and Environmental Plant Physiology - 2009 - Elsevier

Articoli scientifici e supporti didattici forniti dal docente

AMBIT	20879-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	51
COURSE ACTIVITY (Hrs)	24

EDUCATIONAL OBJECTIVES OF THE MODULE

The aim of the Stress Ecophysiology module is to provide students with the knowledge of issues related to plant ecophysiology and the adaptation of higher plants to their environment, in optimal and stressful conditions, analyzing the eco-physiological biodiversity at an intra and interspecific level. The aim of the course is also to provide the necessary tools to apply this knowledge to the study of adaptive responses of plants, interpreting experimental data and evaluating the biotic and abiotic factors that influence the physiology of plants and their ability to adapt to the environment. The course will provide the bases to be able to critically examine the international scientific literature on ecophysiological studies, with particular regard to issues related to global climate change.

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the course. Influence of abiotic and biotic environmental factors on plant development and physiology. Functional traits as tools for research in plant ecophysiology.
6	Drought stress: adapting to arid environments. Control of the plant water balance. How water potential components relate to cell volume and cell wall elasticity: analysis of pressure-volume curves. Hydraulic resistance and conductance in plant organs. Cavitation vulnerability. Regulation of stomatal conductance. Isohydric and anisohydric strategies.
4	Morphological, physiological and biochemical adaptations to optimize photosynthesis. CAM metabolism in succulent plants. The role of phytochrome in adapting to light. Shade adaptment and shade avoidance.
8	Main stress factors in the Mediterranean area. Salt stress: osmotic factors and cell toxicity factors. Heat stress. Light stress. Oxidative stress.
4	Ecophysiological aspects of plant-fire interactions.