UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche		
ACADEMIC YEAR	2019/2020		
MASTER'S DEGREE (MSC)	BIODIVERSITY AND ENVIRONMENTAL BIOLOGY		
INTEGRATED COURSE	BIOLOGICAL ANALYSIS OF ECOSYSTEMS		
CODE	18625		
MODULES	Yes		
NUMBER OF MODULES	3		
SCIENTIFIC SECTOR(S)	BIO/04, BIO/03		
HEAD PROFESSOR(S)	NASELLI FLORES LUIGI	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	ODDO ELISABETTA	Ricercatore	Univ. di PALERMO
	TROIA ANGELO	Ricercatore a tempo determinato	Univ. di PALERMO
	NASELLI FLORES LUIGI	Professore Associato	Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**NASELLI FLORES LUIGI**		
	Monday 10:30 11:30 Studio del docente, Via Archirafi, 28 - I piano		
	Wednesday 10:30 11:30 Studio del docente, Via Archirafi, 28 - I piano		
	Friday 10:30 11:30 Studio del docente, Via Archirafi, 28 - I piano		
	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		
	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. LUIGI NASELLI FLORES

PREREQUISITES	Good high-school mathematical skills, good abilities in English reading and listening, and basic knowledge of general Ecology are necessary to fruitfully attend the course.
LEARNING OUTCOMES	Acquiring knowledge and comprehension abilities The goals of the class is to get critical tools aimed at (i) identifying and understanding the regulation role of the biota in the different ecosystems, (ii) selecting and identifying the tropho-dynamic structure of ecological communities and (iii) analysing the biological interactions allowing ecosystem functioning. Ability to apply knowledge and comprehension Ability to autonomously build a bio-analytical protocol sized on specific environmental features to be investigated. Ability to illustrate both graphically and orally the results achieved. Judgement autonomy The course is aimed at developing a basic knowledge to evaluate the implications deriving from the selection of biological variables and the general results achieved through the analysis itself. Ability to analyse the principal features deriving from a biological assessment of (local and regional) communities and metacommunities. Communication skills The course will promote the ability to explain and sustain operative choices according to the biological structure and to the environmental features of the different ecosystems. In addition, the ability to underline the importance and the necessity to biologically monitor and control the environment even in (apparently) unimpacted ecosystems. Learning skills The course is aimed at developing the ability to critically analyse specialised scientific literature on the topics of the course. It is also aimed at facilitating the study required in a second-level degree or master course.
ASSESSMENT METHODS	A written exam is scheduled at the end of the course eventually integrated by 2-3 specific questions. The exam is addressed toward ascertaining the ability to determine the ecological status of a given ecosystem through: the analysis of selected figures and graphs from the international literature (Eco-physiology of stress); two or three questions on those aspects of botany related to a fair and sustainable land and environment management the choice and the (Environmental botany); the morpho-functional analysis of selected biondicators (Analysis of ecosystems) provided by the teacher. The test is addressed to demonstrate a general knowledge on all the aspects related to the main topics of the course and in particular to identify i) a basic knowledge on the selection of bioindicators (which grants a score ranging from 18 to 23), ii) a deeper knowledge on how to use autoecological (populations, including their phenotypic plasticity) and sinecological (community) knowledge to perform an environmental assessment (which grants a score ranging between 24 and 27), and iii) a capacity to make projection on future ecological scenarios (which grants a score ranging between 28 and 30 with honours).
TEACHING METHODS	Frontal lectures. Lectures will be given in English if the class includes foreign students or upon request of the students.

MODULE
ENVIRONMENTAL BOTANY

Prof. ANGELO TROIA

SUGGESTED BIBLIOGRAPHY	
Articoli scientifici e supporti didattici forniti dal docente. Scientific articles and learning material will be made available from the lecturer.	
AMBIT	20879-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	51
COURSE ACTIVITY (Hrs)	24

EDUCATIONAL OBJECTIVES OF THE MODULE

The educational goal is the acquisition of basic knowledge in those aspects of botany related to a fair and sustainable land and environment management, with particular reference to: the monitoring of inland waters through the study of macrophytes, the methods for the extinction risk assessment of plant species, and the actions of renaturalisation and ecological restoration, including references to the constructed wetland systems and the problem of invasive alien species. The student will thus be in a position to meet the theoretical knowledge about the importance of biodiversity with the needs and problems related to the management, protection and enhancement of the same biodiversity and of the territory in the daily reality, and she/he will ultimately have acquired the basic skills to be able to operate in important aspects of planning, design and management of the territory.

SYLLABUS

Hrs	Frontal teaching
8	Macrophytes in the monitoring of inland waters, with special reference to Characeae; case studies; sampling and identification of species.
8	Red Lists - IUCN criteria for assessing the risk of extinction of plant species.
8	Ecological restoration - Renaturalisation and phytoremediation. The plants for the environmental restoration and land management: the selection of species according to their role and to the site. The problem of invasive alien plants.

MODULE
ECOSYSTEM ANALYSIS

Prof. LUIGI NASELLI FLORES

SUGGESTED BIBLIOGRAPHY

Articoli su riviste internazionali selezionati dal docente saranno distribuiti agli studenti all'inizio del corso. Gli articoli consentiranno agli studenti di approfondire tutti gli aspetti trattati nel corso. La lista, in relazione ai costanti progressi scientifici in tale ambito, sara' aggiornata e modificata anno per anno.

Articles on international journals will be given out by the lecturer at the beginning of the course. These articles will allow the students to learn about the topics of the course. The list of articles may change from one year to another, to include the newest and most relevant publications.

AMBIT	20879-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48

EDUCATIONAL OBJECTIVES OF THE MODULE

According to the "manifesto" of the 2nd-grade course in Biodiversity and Environmental Biology, the goal of the module "Ecosystem Analysis", in the frame of the I.C. "Biological Analysis of Ecosystems", is to give to students a good knowledge on the scientific methods necessary to develop a critical vision on the role exerted by the organisms and their interactions on a suitable (meta)ecosystem functioning. The course is also aimed at highlighting how human impacts on the biological structure of ecosystems may cause a threat to human survivorship. The cultural and technical skills useful to be an expert in the biological management will be also provided. Biological "deviations" will be also analysed in relation to ecotoxicological aspects dealing with the functioning of different ecosystems.

SYLLABUS

Hrs	Frontal teaching
8	Introduction to the course. Analysis of the ecological problems coming from the human use of natural resources. Human-induced impacts on the different ecosystems at a global scale.
8	Analysis of the biological structures in the different ecosystem typologies. Biodiversity and its role in maintaining the emergent properties of ecosystems: stability, resilience, resistance. Importance of biological redundancy. Analysis of human impacts on aquatic and terrestrial ecosystems.
8	Ecological relationships among the different biological compartment of ecosystems. Functional roles of organisms and analysis of their functional traits. Relationships between morphology and function in analysing the biological structure of ecosystems.
8	Morpho-functional traits and ecological role of organisms. Functional classifications vs. taxonomic classifications. How to identify and measure morpho-functional traits of ecological communities. Protocols for the analysis of the ecological state of ecosystems through the analysis of morpho-functional traits of organisms.
8	Functional classification of terrestrial and aquatic vegetation and their use in the analysis of ecosystems. C-S-R-classification and ecosystem trajectories. Functional analysis of zooplankton and macroinvertebrates. Fish functional groups
8	How to apply morpho-functional classifications to characterise terrestrial ecosystems.

MODULE
ECO-PHYSIOLOGY OF STRESS

Prof.ssa ELISABETTA ODDO

SUGGESTED BIBLIOGRAPHY

Taiz, Zeiger – Fisiologia Vegetale – 2013 - Piccin
Pignatti – Ecologia Vegetale –1995 - UTET

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

Knowledge and learning outcomes
Knowledge and understanding of topics of ecophysiology and how higher plants adapt to their environment, both under optimal and stressful conditions. Knowledge of the methods for field survey and laboratory experiments to study plant responses to environmental conditions. Analysis of ecophysiological biodiversity at intra- and interspecific levels.

Ability to apply knowledge and comprehension skills
Students will develop the ability to use their knowledge of plant physiology to understand plant adaptation to the environment and to plan and carry out ecophysiological research projects aimed at the characterization, management and conservation of plant species. structure-function relation at the cell, organ and whole-plant level.

Independent judgement
Ability to analyze and interpret experimental data and evaluate the biotic and abiotic factors that influence plant physiology and their abillity to adapt to the environment. Critically review international scientific papers in the field of plant ecophysiology, particularly regarding topics related to global climate change.

Communication skills
Ability to discuss clearly and in depth about the course subjects using appropriate scientific language. Ability to explain the complex interactions between physiological processes and environmental factors. Ability to elaborate and present experimental data.

Learning ability
Ability to update scientific information through the consultation of pertinent scientific papers. Ability to follow, using the knowledge acquired from the course, second level master courses, doctoral courses, specialistic workshops and seminars in the field of conservation and management of plant natural resources.

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the course. Influence of abiotic and biotic environmental factors on plant development and physiology.
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: pressure-volume curves. Root development and water availability. Hydraulic resistance and conductance in plant organs. Cavitation vulnerability. Regulation of stomatal conductance. Isohydric and anisohydric strategies.
2	Salt stress: osmotic factors and cell toxicity factors.
2	Temperature stress: effects of heat and freezing.
2	Nutrient stress: deficiency or excess. Heavy metal contamination. Plant-soil interactions: root secretion.
2	Light stress and photoprotection systems. Morphological, physiological and biochemical adaptations to optimize photosynthesis. Shade adaptment and shade avoidance.
1	Oxidative stress and scavenging systems. Combined stress factors in Mediterranean environments.
1	Biotic stress. Defence mechanisms. Plant-plant interactions: competition and allelopathy.
6	Reading and discussion of selected scientific articles.