UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2020/2021
MASTER'S DEGREE (MSC)	BIODIVERSITY AND ENVIRONMENTAL BIOLOGY
INTEGRATED COURSE	PLANT EVOLUTION AND CONSERVATION
CODE	19781
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	BIO/01, BIO/02
HEAD PROFESSOR(S)	SALMERI CRISTINA MARIA BERNARDINA — Professore Associato — Univ. di PALERMO
OTHER PROFESSOR(S)	RAVERA SONIA — Professore Associato — Univ. di PALERMO SALMERI CRISTINA MARIA BERNARDINA — 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	**RAVERA SONIA** Tuesday 12:30 13:30 In presenza in via Archirafi 38 o su piattaforma Teams su richiesta appuntamento con mail a sonia.ravera@unipa.it Thursday 12:30 13:30 In presenza in via Archirafi 38 o su piattaforma Teams su richiesta appuntamento con mail a sonia.ravera@unipa.it **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

PREREQUISITES	Basic Knowledge about Plant Biology and Plant Physiology
LEARNING OUTCOMES	KNOWLEDGE AND LEARNING OUTCOMES Students will learn detailed contents about plant evolutionary biology and plant phylogenetic relationships, as well as about the conservation of plant genetic diversity and plant reproduction with special focus on in situ/ex situ conservation. They will be able to understand the meaning of occurrence of specific traits and adaptive strategies in function of evolution and phylogeny, the key role of plants-environment interactions in the evolutionary events, and the matters related to the conservation and valorization of phyto-resources. ABILITY TO APPLY KNOWLEDGE AND COMPREHENSION SKILLS Students will be able to compare the evolutionary models facing the main plant phylogenetic lineages, and to understand their functioning, similarity, and diversity, as well as their role in maintaining current and past biodiversity. They will also acquire the ability to choose appropriate conservation methods related to plant population analysis within natural or anthropic environments and to relate the acquired knowledge in the field of ecology and plant conservation. Students will also learn lab protocols for germplasm conservation. INDEPENDENT JUDGMENT Students will be provided with skills for critically analyze and evaluate the global importance of plant evolution functional diversity, the biological and environmental events which regulate plant evolution. They will be able to identify the resilience capacity of a plant population in relation to real and potential threats and environmental changes. COMMUNICATION SKILLS The course gives students language proficiency and capability to deal with relevant scientific issues, such as biological evolution, plant biodiversity origin, germplasm conservation and use in biotechnologies, economic relevance of plant genetic resources in agri-food, horticulture and industry. Students will also able to process and represent, both verbally and graphically, experimental data and own comments regarding special course topics and biology matters in general. LEARNING ABILITY Students will be able to apply acquired information and skills for further update and development of their scientific expertise, including specialist literature search, web database consultation, participation to specialized seminars and second level master courses, learning new biotechnological and bioinformatics' methods for data management
ASSESSMENT METHODS	TYPE OF ASSESSMENT - Intermediate essay: descriptive/argumentative oral essay on selected topics. - Final exam: oral examination; for each module, student must answer at least 4 questions about the main program topics. ASSESSMENT CRITERIA - Intermediate essay: Results expressed in qualitative form, from unsatisfactory to excellent, considering the logical-analytical skills and the ability to synthesize information, as well as the acquired proper language. Results are satisfactory if basic knowledge and essential technical language are demonstrated. Results are considered excellent if detailed knowledge and mastery skills on the course topics are fully managed. - Final oral exam: students are evaluated for their acquired knowledge on plant evolution and conservation, levels of learning of the course contents, logical-deductive skills, and the proper use of suitable scientific lexicon. Results are expressed in thirtieths. The final exam is considered sufficient, with minimum score 18/30, if students show at least an overall knowledge on the main issues, being aware of basic paths of plant evolution, functional diversity, and plant conservation strategies. Results are evaluated as excellent, with a score of 30/30, if students show detailed knowledge of the whole program, logical and analytical skills allowing them to apply possible cross-links and deductive personal interpretations, using an appropriate scientific lexicon.
TEACHING METHODS	Lectures, Field/Lab Practicals

MODULE
PLANT EVOLUTION AND FUNCTIONAL DIVERSITY

Prof.ssa CRISTINA MARIA BERNARDINA SALMERI

SUGGESTED BIBLIOGRAPHY

JUDD W.S. et al. (2007). Botanica sistematica un approccio filogenetico. PICCIN, Padova.
NEIL A. et al. (2004). Biologia. Meccanismi dell'evoluzione e origini della diversita. ZANICHELLI, Bologna.

Dispense e articoli scientifici distribuiti dal docente durante il corso [Texts and scientific papers provided during course lessons]

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

EDUCATIONAL OBJECTIVES OF THE MODULE

Outlining the key steps of evolution in plants, describing the systematic grades and phylogenetic relationships of main groups. Understanding the evolutionary trends of land plant structure and features, particularly those associated with reproductive systems. Recognizing the evolutionary significance of the plant adaptive strategies to environments, correlating their structural and functional aspects, mainly conneted with conservation. Understanding the role and value of functional traits in biosystematic and ecological studies.

SYLLABUS

Hrs	Frontal teaching
4	Introduction to the Course, execution means, texts and other didactic tools. The main lines of evolution in plants. Evidence for endosymbiosis and algal phylogenetic clades. Phylogeny of green algae
4	The origin of lands plants: theories, difficulties, adaptive strategies. Phylogenetic relationships between green algae and early land plants (Rhyniophyta and Zosterophyllophyta)
4	Body evolution and adaptive changes in land plants. Evolutionary modification of life cycle to land environments. The evolution of the Embryophyte life cycle.
4	Origin of Embryophytes: symplesiomorphy and synapomorphy. Origin and evolution of non-vascular land plants (bryophytes). Relationships and phylogenetic lines of non-vascular plants: Bryophyta, Marchantiophyta, Anthocerophyta
4	Vascular land plants (tracheophytes): body evolutionary innovations, microphylls and megaphylls. Thrimerophytes and the telome theory of leaf evolution. Evolutionary steps in reproductive systems (isospory and heterospory) and life cycle. The meanings of structural and functional adaptation to aerial environments
4	Evolutionary and functional traits, Systematics and phylogeny of vascular non-seed plants: classes Lycopodiopsida and Polypodiopsida
2	Seed plants: role and evolutive function of distinctive vegetative and reproductive features. Primitive and derived characters in gametophyte and sporophyte generation.
6	Phylogenetic role of fossil groups (Progymnosperms, Seed ferns, Cordaitales, Bennettitales). Origin and phylogeny of extant Gymnosperms.
2	Flowering plants (Angiosperms): primitive and derived features. Evolutionary innovations in plant body and reproduction strategies. Relationships with Gymnosperms (the Anthophyte theory)
6	The importance of flower in angiosperm evolution. Development of flower traits and pollination systems. Floral syndrome, adaptation and diversification of flower structures.
2	The importance of fruits in angiosperm evolution. Relations between seed dispersal models and plant spatial spread
4	Seed and germination ecophysiology. Seed dehydration, water content, dormancy, vitality and vigour. Germination tests
2	Angiosperm phylogeny based on nuclear and plastid genes (APG IV). Evolutionary traits of early angiosperms (ANA), eudicots and monocots.

MODULE
CONSERVATION OF PHYTOGENETIC RESOURCES

Prof.ssa SONIA RAVERA

SUGGESTED BIBLIOGRAPHY

Ferrari C. 2011. Biodiversità. Dal genoma al paesaggio. Zanichelli.
Bradford K. J., Nonogaki H. 2008. Seed development, dormancy and germination. Annual Plant Reviews, Vol. 27. Wiley-Blackwell, Oxford.
G. Bacchetta et al. 2006. Manuale per la raccolta, studio, conservazione e gestione ex situ del germoplasma. APAT, Roma.
Dispense e articoli scientifici distribuiti dal docente durante il corso.

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

EDUCATIONAL OBJECTIVES OF THE MODULE

The course will provide fundamental insights on plant reproductive and developmental biology, as well as on the role of genetic diversity conservation to preserve the biological integrity of wild and cultivated species. Importance of phytogenetic resources, in situ and ex situ conservation strategies for rare, threatened species and crop wild relatives, applied methods for germplasm propagation and conservation will be addressed.

SYLLABUS

Hrs	Frontal teaching
4	Module contents and objectives. Plant genetic resources and their applications to the food, agriculture and industry sector.
4	Fundamentals of plant propagation and reproduction
4	Development, maturation, structure and composition of seeds.
4	Meristematic cells and regions. Totipotency. Cell differentiation and regeneration. The role of hormones in relation to determination, differentiation and regeneration.
4	Hierarchical organization of biodiversity and practical implications in plant conservation.
4	Description of plant genetic resources. Crop wild relatives. Genetic erosion. Landraces. Biodiversity and commercial aspects in seed commerce.
6	Conservation strategies for plant biodiversity. In situ conservation of native species. Study cases.
6	Ex situ germplasm conservation. Botanical gardens, Seedbanks, cryopreservation. Synthetic seeds. Study cases
4	Collection, cataloguing, promotion, and conservation of germplasm from threatened or endangered plant using in vivo and in vitro collections.

Hrs	Practice
6	Practicals on seed germination related to environmental parameters.
6	Practicals on in situ and ex situ conservation techniques