UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche		
ACADEMIC YEAR	2018/2019		
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/02, BIO/01		
HEAD PROFESSOR(S)	SCIALABBA ANNA	Cultore della Materia	Univ. di PALERMO
OTHER PROFESSOR(S)	SALMERI CRISTINA MARIA BERNARDINA	Professore Associato	Univ. di PALERMO
	SCIALABBA ANNA	Cultore della Materia	Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**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 **SCIALABBA ANNA** Wednesday 10:00 14:00 Dipartimento STEBICEF. Sezione Botanica ed Ecologia Vegetale. Via Archirafi. 38A previo appuntamento via e-mail.		

DOCENTE: Prof.ssa ANNA SCIALABBA

PREREQUISITES	Plant biology, Genetic
LEARNING OUTCOMES	KNOWLEDGE AND LEARNING OUTCOMES Students will learn detailed contents about plant evolutionary biology and plant phylogenetic relationships, the diversity of wild and cultivated plants, the conservation of plant genetic diversity and plant reproduction with special focus on ex situ conservation, seed quality control, and biotechnological applications. 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, the issues related to the production of phyto-resources, and the main protocols for genetic analysis [plant DNA extraction and conservation, amplification of genetic markers for plant phylogeny, extraction and interpretation of phylogenetic trees] 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, traditional or innovative, ex situ conservation methods related to plant population analysis within natural or anthropic environments. Students will also learn lab protocols for phylogenetic analyses and bioinformatic tools for data management. INDEPENDENT JUDGMENT Students will be provided with skills for critically analyze and evaluate the global importance of plant evolution and biodiversity, the biological and environmental events which regulate plant evolution. They will be able to assess the reproductive potential of a plant population in relation to environmental changes, foresee stability and maintenance of the related genetic diversity, and evaluate potential benefits and inherent limitations of biotechnologies in the field of ex situ conservation and sustainable use of phyto-resources. 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 agro-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, ability to correlate and integrate the information gained with those of other courses.
ASSESSMENT METHODS	TYPE OF ASSESSMENT IN PROGRESS ESSAYS: 2 essays during the course; one written essay and one oral presentation of a selected subject. The written essay, over a 1 hour per module, is semi-structured with 30 questions on the covered course contents, 3 of which open-ended. Closed-ended questions aim at testing the acquired knowledge and skills of the disciplinary scope of the course, while the open-ended questions are to check the good command of treated subjects, the vocabulary skills and the ability to apply knowledge and skills to solve the proposed issues. The oral presentation aims at encouraging capacity of synthesis, elaboration and discussion using the appropriate vocabulary FINAL EXAM: oral examination. Student must answer at least 4 questions about the main program topics per module ASSESSMENT CRITERIA IN PROGRESS ESSAYS: results scored out of 30. Essays are passed with minimum score 18/30 when the student is in possession of the minimum basic knowledge of the main topics of teaching and the technical language and minimal ability for independently applying the knowledge gained. The maximum score of 30/30 is applied when students have reached a deep knowledge and full command of all topics. FINAL EXAM: the student is evaluated for the acquired specific knowledge, the levels of learning of course contents, the logical-deductive and verbal ability, and the proper use of suitable scientific vocabulary. Results scored out of 30. The final exam is considered to be sufficient, with minimum score 18/30, when student shows at least an overall knowledge on the main issues. Results are evaluated as excellent, with a score of 30/30, also with honours, when student shows detailed knowledge of the whole program, logical and analytical skills about evolutionary processes which allow him to apply possible cross-links and deductive personal interpretations, using an appropriate scientific vocabulary.
TEACHING METHODS	Lectures, Tutorials

MODULE
CONSERVATION OF PHYTOGENETIC RESOURCES

Prof.ssa ANNA SCIALABBA

SUGGESTED BIBLIOGRAPHY

C. Ferrari – Biodiversita. Dal genoma al paesaggio. Zanichelli. 2011.
K. J. Bradford and H. Nonogaki - Seed development, dormancy and germination. Blackwell. 2008.
R.J. Henry - Plant genotyping. The DNA fingerprinting of plants. CABI Pubishing. 2011
G.Pasqua - Biologia cellulari e Biotecnologie vegetali. Piccin. 2011
APAT- Manuale per la raccolta, studio, conservazione e gestione ex situ del germoplasma

Materiale cartaceo e lavori scientifici forniti dal docente. Printed materials provided by the professor.

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

EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to provide fundamental insights on reproductive biology and genetic biodiversity of wild and cultivated species with the aim to preserve their biological integrity. Evaluation of seed quality and methodological aspects for genotypic characterization of ex situ germplasm collections will be addressed.

SYLLABUS

Hrs	Frontal teaching
4	Introduction. Plant genetic resources. Biodiversity and Biotechnolgy.
4	Plant reproduction biology. Seeds: development, maturation, structure and composition.
4	Meristematic cells and regions. Totipotency, cell differentiation and regeneration. The role of hormones in relation to determination, differentiation and regeneration.
4	Somatic embryogenesis in gymnosperms and angiosperms. Protoplast. Hybridization. Influence of hormonal and environmental factors on seeds and pollen germination.
4	Ex situ germplasm conservation: hierarchical organization of biodiversity. Intraspecific diversity and genetic diversity measurement. Use of population-based genetic data for the preservation of rare species. Self-assessment on the topics covered by the course.
4	Biodiversity with respect to its practical implications for biodiversity preservation of wild populations, germplasm collections and plant breeding. Wild progenitors of crop cultivars and genetic erosion. Biodiversity and commercial aspects in seed commerce.
4	The collection, cataloging, promotion and conservation of threatened or endangered plant germplasm using in vivo and in vitro collections.
4	Genebanks, cryopreservation. Synthetic seeds. DNA bank-Net. Biodiversity, quantity and quality improvement of food products.
4	Physiology of conservation: dehydration and determination of water content. Dormancy and germination eco-physiology.
4	Monitoring of orthodox seeds quality during storage (vitality, vigor, natural and artificial ageing). Amplification methods of ageing symptoms, osmo-priming.

Hrs	Practice
12	1. Reproductive Biology: influence of environmental factors on seed germination. 2. Conservation Physiology: dehydration tests, determination of water content. Monitoring of seed quality during storage using amplification methods of ageing symptoms. Artificial seeds ageing.

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. Understanding the role and value of modern molecular methods in phylogenetic studies.

SYLLABUS

Hrs	Frontal teaching
5	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.
5	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
6	Angiosperm phylogeny based on nuclear and plastid genes (APG IV). Evolutionary traits of early angiosperms (ANA), eudicots and monocots. Analysis of gene sequences, methods for phylogenetic analyses, construction and interpretation of phylogenetic trees