UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	BIODIVERSITY AND ENVIRONMENTAL BIOLOGY
INTEGRATED COURSE	PLANT MONITORING AND CONSERVATION
CODE	22616
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	BIO/03, 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, knowledge about Plant Systematics
LEARNING OUTCOMES	KNOWLEDGE AND UNDERSTANDING Students will acquire in-depth knowledge on methods for environmental biomonitoring and in situ and ex situ conservation of plant biodiversity. They will learn the current regulations and procedural standards at national and EU level. Students will be able to understand how to correctly carry out red listing approaches (according to the IUCN criteria standards) and to assess the conservation status of endangered plant species, to identify risks and threat factors, to perform a biomonitoring analysis of endangered species and habitats, and to know the required steps for the treatment and conservation of plant germplasm. APPLYING KNOWLEDGE AND UNDERSTANDING Students will have to learn how to apply methods and tools for environmental biomonitoring and the conservation of plant species and communities, with specific regard to the species of conservation interest and the habitats of the "Habitat" Directive 92/43 EEC, and with particular reference to the national and regional framework. They will develop the ability to correlate the acquired knowledge and apply it in the ecological sector and in the conservation of plant resources. In addition, mastery of laboratory and field techniques will be achieved in lichen biomonitoring and the propagation and conservation of germplasm. MAKING JUDGMENTS 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 Students will have to acquire the vocabulary and techno-scientific terminology also in order to join teams dealing with nature conservation and to understand any further information through specialized bibliography. Furthermore, they will develop the capacity of elaborating and presenting, even to common audience, results from experimental data, and deductive reasoning on course topics and biodiversity in general. LEARNING SKILLS Students will be able to apply attained knowledge and skills for updating and critically improving their techno-scientific capability, also through specific bibliographic search, consultation of databases and thematic portals, attendance to seminars and masters, learning IT approaches for managing experimental data.
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 bio-monitoring and plant conservation, the quality of learning of the course contents, the 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 the fundamentals of environmental bio-monitoring, the basic concepts of in situ and ex situ conservation and the main study methods. 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. In detail, the final exam will be assessed as follows: Excellent (30-30 cum laude): excellent knowledge of the topics, excellent language skills, good analytical skills; the student knows how to apply the knowledge acquired to answer the proposed questions. Very good (27-28): good command of subjects and full ownership of language; the student is able to apply the knowledge to answer the proposed questions.

	Good (24-26): basic knowledge of the main topics, fair language properties, with limited ability to independently apply knowledge to the solution of the proposed questions. Satisfactory (21-23): the student does not have full command of the main topics of the program; poor ability to autonomously apply the acquired knowledge, satisfactory language properties. Sufficient (18-20): basic knowledge of the main topics of the program, reduced but acceptable language properties, elementary technical language, very little or no ability to independently apply knowledge acquired. Insufficient - the student does not have an acceptable knowledge of the contents of the topics covered in the program.
TEACHING METHODS	Lectures, Lab / Field Practicals

MODULE
EX SITU AND IN SITU CONSERVATION METHODS

Prof.ssa CRISTINA MARIA BERNARDINA SALMERI

SUGGESTED BIBLIOGRAPHY

- Rossi G. et al. 2013. Linee Guida per la traslocazione di specie vegetali spontanee. Quad. Cons. Natura, 38, MATTM – Ist. Sup. Protezione e Ricerca Ambientale (ISPRA), Roma. ISSN: 1592-2901 [Download: https://www.isprambiente.gov.it/files/pubblicazioni/quaderni/natura-e-biodiversita/files/QUADConsNat_38.pdf]
- Bacchetta G. et al. (eds.) 2006 - Manuale per la raccolta, studio, conservazione e gestione ex situ del germoplasma. APAT. ISBN: 88-448-0179-5 [Download: https://www.isprambiente.gov.it/contentfiles/00003400/3470-manuali-2006-37.pdf] English version available

Approfondimenti / In-depth information

- Ercole S. et al. (eds.) 2021. Rapporti Direttive Natura (2013-2018). Sintesi dello stato di conservazione delle specie e degli habitat di interesse comunitario e delle azioni di contrasto alle specie esotiche di rilevanza unionale in Italia. ISPRA, Serie Rapporti 349/2021. ISBN: 978-88-448-1063-4 [Download: https://www.isprambiente.gov.it/files2021/pubblicazioni/rapporti/rapporto-349_2021_direttive_natura_def.pdf]
- Bacchetta G. et al. 2014. Procedure per il campionamento in situ e la conservazione ex situ del germoplasma. Manuali e linee guida ISPRA 118/2014. ISBN 978-88-448-0679-8 [Download: https://www.isprambiente.gov.it/public_files/MLG_118_14.pdf]

Dispense e articoli scientifici saranno inoltre distribuiti dal docente durante il corso
Lecture notes and scientific papers will be provided by the teacher during the course

AMBIT	20879-Attività formative affini o integrative
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to provide students with knowledge and skills on methods for in situ and ex situ conservation of plant biodiversity. Main regulations and working tools aimed at 1) defining the conservation status of plant species and communities, 2) critically assessing the level of risk according to international standards, and 3) formulating proposals for conservation interventions, will be presented. The course will also address the best strategies to preserve the genetic resources of endangered species, by ensuring proper germplasm collections to be used for habitat recovery or restoration. To this purpose, specific sampling and propagation techniques for threatened plant species, germplasm bank management and short-/ long-term conservation procedures will be illustrated and applied.

SYLLABUS

Hrs	Frontal teaching
5	Introduction to the course. Conservation of plant biodiversity: in situ and ex situ actions (differences and objectives). Conservation priorities: Red List, Global Strategy for Plant Conservation (GSPC) and European Plant Conservation Strategy (EPCS). Habitat Directive 43/92 EEC and Natura 2000 sites. Objectives and purposes of the SAC / SPA management plans for the conservation of natural habitat and wild species, with reference to the Sicilian territory
5	Rarity and vulnerability to extinction. IUCN categories. Guidelines and application criteria (IUCN Red List Assessment). Main threats to plant species and populations in the national context. Biological invasions: classification of alien species, causes favouring invasiveness, impacts on ecosystems, management strategies
5	National and European conservation Programs (species-specific or habitat-specific). Translocations: reinforcements, reintroductions, conservative introductions. Environmental restoration with ecological-naturalistic criteria
3	Ex-situ conservation of plant genetic resources: in vivo collections (collection fields, botanical gardens) and germplasm banks (seeds, spores, tissues). Definition of Biobank. The UNI ISO 20387 Standard for the biobanks' accreditation
7	Germplasm sampling: selection criteria for populations and individuals, sampling models, sampling protocols (operational techniques and datasheets). Germplasm accession. Acceptance protocols, cleaning and qualitative-quantitative analysis of accessions
8	Eco-physiology of seeds and germination. Dormancy, vitality, vigour, and longevity. Methods of controlled dehydration, calculating and monitoring of water content. Germplasm storage. Management of ex situ collections
7	Vitality and vigour assessment of germplasm accessions (germination test, priming, tetrazolium test, aging tests). Indices for vitality and vigour assessment. Setup of germination protocols

Hrs	Practice
3	Planning in situ conservation interventions on target species. Criticality analysis and possible intervention strategies
6	Tests for the assessment of seeds vitality and vigour. Germination protocols setup in wild species
3	Field trip to conservation sites

MODULE
ENVIRONMENTAL BIO-MONITORING METHODS

Prof.ssa SONIA RAVERA

SUGGESTED BIBLIOGRAPHY

1) Lorenzini G. & Nali C., 2019 (3° Edizione). Le piante e l'inquinamento dell'aria, Springer Verlag. ISBN 8847003210
2) EN 16413:2014 - Ambient air - Biomonitoring with lichens - Assessing epiphytic lichen diversity. ISBN 9780580777936
3) ISPRA, 2020. Guidelines for the use of lichens as bioaccumulators. ISPRA, Manuali e Linee
Guida 189bis/2019, pp. 60. (Download: https://www.isprambiente.gov.it/files2020/pubblicazioni/manuali-e-linee-guida/guidelines-for-use-of-lichens-as-bioindicators_def.pdf)

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 theoretical and practical tools for a specific competence in the field of environmental alteration assessment, using the most modern bioindication methodologies required by current legislation at national and community level. The main compartments considered are the atmosphere and terrestrial habitats; the bioindicators that will be investigated are plant organisms, considered the most practical, suitable and effective tools for acquiring information on the state of the environment.

SYLLABUS

Hrs	Frontal teaching
4	Introduction to the course. Definition and principles of bioindication and monitoring.
4	Characteristics of bioindicators and bioaccumulators. Bioindication at different levels of biological organization. Hints on the use of ecophysiological stress tests.
4	Concepts and applications in functional diversity.
2	Introduction to biomonitoring techniques.
6	Epiphytic lichens as bioindicators of air pollution.
6	Bioaccumulation of trace elements and radionuclides through native and allochthonous lichens and mosses.
4	Vascular plants as bioindicators and bioaccumulators.
4	Biomonitoring for the environmental management of protected areas.
2	Applications and study cases.
4	Data interpretation. Quality assurance.

Hrs	Practice
6	Experiences on lichens as indicators of environmental alterations.
6	Design of a biomonitoring network