UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare		
ACADEMIC YEAR	2021/2022		
BACHELOR'S DEGREE (BSC)	NATURAL AND ENVIRONMENTAL SCIENCE		
INTEGRATED COURSE	ECOLOGY - INTEGRATED COURSE		
CODE	02679		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	BIO/07		
HEAD PROFESSOR(S)	CHEMELLO RENATO	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)	MILAZZO MARCO CHEMELLO RENATO	Professore Ordinario Professore Ordinario	Univ. di PALERMO Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	2° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**CHEMELLO RENATO** Wednesday 10:30 12:30 Dipartimento di Scienze della Terra e del Mare, via Archirafi n. 20, Stanza n. 4, piano IV, Thursday 10:30 12:30 Dipartimento di Scienze della Terra e del Mare, via Archirafi n. 20, Stanza n. 4, piano IV, **MILAZZO MARCO** Tuesday 10:00 11:00 Via Archirafi 20 IV piano Stanza Prof. M. Milazzo		

DOCENTE: Prof. RENATO CHEMELLO

PREREQUISITES	Basic knowledge of Zoology and Botany, and elements of Statistics
LEARNING OUTCOMES	Knowledge and understanding The knowledge and understanding will be oriented to the acquisition of theoretical and experimental skills for ecosystems monitoring and management. Particular attention is paid to the understanding of ecosystems, the causes of their deterioration and the monitoring, rehabilitation and recovery methods. The student will also obtain integrated knowledge about natural processes occurring both in biotic and abiotic systems, their interactions and the influence that human activities exert on ecosystems. Skills and comprehension skills are acquired through participation to lectures, excursions in natural environments and participation to seminars and conferences organized by appropriately degree program on current affairs and general interest. The achievement of learning outcomes is verified through exams. Applying knowledge and understanding At the end of the course, the student must attain multidisciplinary application capabilities to the assessment, monitoring and management of natural environments. In particular, the student, on the basis of specific knowledge acquired, integrated with experiences during lectures and practice, must be able to design systems recovery programs. The achievement of these capabilities is verified through tests on specific topics. Making judgments Students will develop skills regarding: the assessment and the interpretation of experimental laboratory and field data; principles of professional ethics and scientific approach to bioethical issues. In particular, on the basis of knowledge acquired, they must be able to carry out the assessment of the environmental state, to coordinate environmental monitoring through the use of indices and indicators, to propose hypotheses and plans of rehabilitation and environmental recovery. Independent judgment is realized through the experience gained through lectures and exercises. The acquisition of judgment skills is verified through written and oral tests along with in-course (ongoing) tests. Communication skills Students must acquire adequate skills and tools for communication, must be able to process and present data, and work in team. They also must be able to present the basic concepts of evaluation, monitoring and management of ecosystems, integrating them with the natural variability concept of systems and changes induced by human activities. Communication skills are developed and stimulated throughout the course, encouraging the group study and all activities related to the final exam. Assessment of the achievement of these capabilities is verified through the final exam, during which skills, appropriateness and rigor in the exposition are measured. Learning ability Students will have to develop appropriate skills for independent deepening of additional competences, for instance: consultation of library materials, access to databases and other information on the web, basic tools for the continuous updating of knowledge. Learning skills are developed throughout the course with particular reference to individual and team study and the design of a research program.
ASSESSMENT METHODS	A short test is given to the students to assess their individual preparation at the beginning of the course. The final exam will consist of an oral examination. The student under examination will have to answer at least three questions posed orally, on all parts of the program, with reference to the suggested texts. The final examination aims at assessing whether the student has knowledge and understanding of the subjects, has acquired interpretative competence and autonomy in judging concrete cases. The threshold of sufficiency will be achieved when the student shows the knowledge and understanding of the topics at least in the general guidelines and has minimal application skills; He must equally have exhibits and arguments that enable him to convey his knowledge to the examiner. Below this threshold, the examination will be insufficient. Instead, the student manages to interact with the examiner with his argumentative and exhibition skills, and the more his knowledge and application skills go into detail of the discipline being tested, the more the evaluation will be positive. The final exam score will be done in thirtieth. Excellent (30-30 cum laude). Excellent knowledge of the topics, excellent properties of language, good analytical ability. The student is also able to apply his/her knowledge to solve all proposed problems Very good (26-29). Good mastery of the topics, full property of language. The student is able to apply his/her knowledge to solve proposed problems. Good (24-25). The student reached a basic knowledge of the main topics, discrete properties of language, with limited ability to independently apply the his/her knowledge to the solution of the proposed problems. Satisfactory (21-23). The student does not have full mastery of the main topics of teaching, but it possesses the knowledge, satisfactory property language, poor ability to independently apply the acquired knowledge. Sufficient (18-20). The student has a minimum basic knowledge of the main

	topics and technical language issues, very little or no ability to independently apply the acquired knowledge. Insufficient - The student does not have an acceptable knowledge of the contents of the topics covered in the course
TEACHING METHODS	Classroom lectures and exercises

MODULE
EXPERIMENTAL ECOLOGY

Prof. MARCO MILAZZO

SUGGESTED BIBLIOGRAPHY

J Fowler, L Cohen – Statistica per ornitologi e naturalisti. Franco Muzzio Editore (2010)
CJ KREBS – Ecology: the experimental analysis of distribution and abundance. Benjamin/Cummings Science (2011)
GP QUINN, MJ KEOUGH – Experimental design and data analysis for biologists. Cambridge University Press, Cambridge (2002)

AMBIT	50171-Discipline ecologiche
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

The aim of the course is to increase students' knowledge on applied aspects of ecology with a specific focus on case-studies assessment and on descriptive and manipulative experiments generating ecological theory. In addition, the course will provide students both the basic knowledge and the analytical tools commonly used in ecology.

SYLLABUS

Hrs	Frontal teaching
2	General description of the Experimental Ecology course – Introduction to applied studies in ecology – potential interactions with Ecology 1 course
8	Variability in ecological systems; natural and anthropogenic disturbance; ecological and statistical population; notions on ecological and statistical distributions; abundance estimates; measures od location, dispersion and shape (Connell's experiments); response variables; frequency distributions of ecological variables; sample sizes, sample errors, statistical estimates of the samples, mensurative and manipulative experiments.
4	The main sampling techniques used in (marine) ecological analyses. Stratified and systematic sampling procedures Descriptive and Experimental Ecology. Case studies and applications
6	Logic of an ecological investigation. Hypothesis-testing in Ecology. Logical components of a research project. Ecological experiments: description and manipulations. Experimental designs, sampling procedures and analyses. BACI designs and their 'evolution' in the ecological literature
10	Notions on ecosystem change: global climate change, pollution, resources exploitation, other local human activities. Disturbance in ecology. Sinle and multiple stressors. Resistance and resilience.
10	Crossed and hierarchical factorial design in ecological hypothesis-testing; bias and confounding effects in ecological experiments; pseudoreplication. Multivariate and univariate case studies. Meta-analysis

Hrs	Practice
4	Case studies and applications on the representation of variability components, abundance estimates, frequency distributions of ecological variables
4	Case studies and applications on crossed and hierarchical factorial designs in ecological hypothesis-testing
4	Case studies and applications using meta-analyses

MODULE
GENERAL ECOLOGY

Prof. RENATO CHEMELLO

SUGGESTED BIBLIOGRAPHY

Smith TR & LR Smith (2007) Elementi di Ecologia. Pearson Ed.
Pusceddu A., G. Sarà, P. Viaroli (2020). Ecologia. Utet Ed.
Materiale fornito dal docente

AMBIT	50171-Discipline ecologiche
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52

EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to provide students with a cultural background and experimental and analytical notions to tackle studies of basic ecology and ecosystems functioning. In particular, it aims to highlight the network of relationships linking organisms and their environment, also with reference to the interactions that result from human activities.

SYLLABUS

Hrs	Frontal teaching
4	General and Theoretical Ecology - Introduction to ecological studies - Interaction with other disciplines - Holistic view and reductionist - Autoecology and synecology - functional levels of ecological organization - temporal and spatial scales - ecological systems - emerging properties - entropy and ecological systems - diagrams of flow and patterns - The positive and negative feedbacks - Homeostasis - The scientific method
4	General elements on the climate machine - Generators and climate effects - The global temperature control: albedo, greenhouse - Climate Change - Air pollution - Soil: composition, Horizons, erosion, soil formation - Vegetation and Landscape
8	Abiotic factors and organisms - the minimum Law - the tolerance Law - physical factors affecting ecological systems - Adaptations - biological stories of species and environmental variability - Allocation of time and resources
8	Populations - Structure, size, dispersion and distribution - Distribution areas - Models of population growth and control factors - The logistic equation - Population dynamics - Pyramids of age - Strategies r K - carrying capacity - Interactions between organisms - Lotka-Volterra model - metapopulation
8	Ecosystems - Mechanisms of ecosystem control - Stability of resistance and resilience - trophic structure. The energy in ecosystems - ecosystem thermodynamic concept - Primary production and limiting factors - The energy flows in the ecosystem - food chains and food webs - Ecological Pyramids - Biological Magnification - Regeneration of nutrients in aquatic and terrestrial ecosystems - Notes on biogeochemical cycles. Water Cycle - Ecological Theory of recycling.
8	Community - Community Theories - Open and closed communities - the continuum concept - ecotones - Interactions between species, competition, predation and parasitism, mimicry, commensalism, mutualism - Ecological niche - native and non-native species - Ecological Succession. Autogenic and allogenic successions - primary and secondary succession - in the evenings Concept - Pioneer and climax communities - patchy mosaic and Landscape - Biodiversity - Geographical variations and species diversity - diversity indexes - Curves of dominance-diversity - The value of biodiversity - biodiversity conservation

Hrs	Practice
4	Exercise 1. Introduction to spreadsheets. How to build matrices in Ecology Two-way and three-way matrices. Population patterns.
4	Exercise 2. Predator-prey models. Life tables and survival curves. Age models.
4	Introduction to conservation ecology.