UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2020/2021
MASTER'S DEGREE (MSC)	MARINE BIOLOGY
SUBJECT	ANALYSIS OF ECOLOGICAL SYSTEMS
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50506-Discipline del settore biodiversità e ambiente
CODE	16177
SCIENTIFIC SECTOR(S)	BIO/07
HEAD PROFESSOR(S)	MILAZZO MARCO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**MILAZZO MARCO** Tuesday 10:00 11:00 Via Archirafi 20 IV piano Stanza Prof. M. Milazzo

DOCENTE: Prof. MARCO MILAZZO

PREREQUISITES	Students' knowledge requirements are basics of Stats and of Ecology
LEARNING OUTCOMES	*Knowledge and comprehension Acquisition of advanced skills to successfully carry out an ecological study and to design an ecological experiment. Acquisition of a high-level ability in the use of specialized scientific language. * Applying knowledge and comprehension Ability in understanding the applied skills required to carry out an ecological investigation. * Autonomous thinking Acquisition of evaluation skills and competences to self-evaluate the results and the outcomes of different ecological case studies. * Communication ability Acquisition of adequate skills and communication tools, with regard to the presentation of the results of experimental ecology studies. Outreach communication and dissemination ability. * Learning ability Acquisition of appropriate skills for the independent achievement of additional competences, with specific reference to sampling designs in an ecological context, as well as computer skills on analysis of ecological systems. Ability to follow specialized and in-depth ecological and statistical seminars for the continuous updating of knowledge.
ASSESSMENT METHODS	An entrance test will be performed to assess the starting students' knowledge on basics of Stats and Ecology. This test is anonymous. A non-mandatory ongoing (mid-course) test will be also carried out using a form with semi-structured/open-ended questions on the first part of the course contents. A positive evaluation of the mid-term test, following the above assessment criteria, will give the student the opportunity to be evaluated on the second part of course contents during the final test. The student's final evaluation grade will be the average of the mid-term and the end-term tests. Student's final evaluation will be carried out by an oral and/or written test with semi-structured/open-ended questions. The questions will be used to verify expected skills, learning abilities and comprehension levels of each student. Questions on the course contents will be provided in order to make them comparable with predetermined correction criteria. Specifically, students will be evaluated upon the level of knowledge of the topics, the ability to interlink them, and the use of a specialized scientific language. *Assessment criteria -assessment: excellent, grade: 30 - 30 cum laude, excellent knowledge of the topics of the course, excellent use of the technical language, excellent analytical capacity, ability to apply knowledge to problem solving; - assessment: very good, grade: 26-29, good knowledge of the topics of the course, correct use of technical language, good analytical capacity, ability to apply knowledge to problem solving; - assessment: good, grade: 24-25, good knowledge of the main topics of the course, correct use of technical language, limited ability to autonomously apply knowledge to problem solving; - assessment: satisfactory, grade: 21-23, partial knowledge of the topics of the course, satisfactory use of technical language, limited ability to autonomously apply knowledge to problem solving; - assessment: sufficient, grade: 18-20, minimal knowledge of the main topics of the course and of technical language, scarce ability or inability to autonomously apply knowledge to problem solving; - assessment: fail, insufficient knowledge of the topics of the course.
EDUCATIONAL OBJECTIVES	The aim of the course is to deepen the students' knowledge on the analysis of marine ecological systems with a specific focus on observational and manipulative experiments. In addition to this, the course will provide students both the basic knowledge and the experimental and analytical tools commonly used in marine ecological studies.
TEACHING METHODS	Lectures (Frontal teaching). Training classes in the computer room.
SUGGESTED BIBLIOGRAPHY	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) AJ UNDERWOOD – Experiments in ecology. Cambridge University Press, Cambridge (1997)

SYLLABUS

Hrs	Frontal teaching
2	Introduction to the aims and topics of the course
6	Ecology and ecological systems; population, community and ecosystem levels
6	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.
6	The main sampling techniques used in (marine) ecological analyses. Stratified and systematic sampling procedures
4	Descriptive and Experimental Ecology. Case studies and applications
8	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
8	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
3	Training classes in the computer room. Computer simulations and case studies on natural and anthropogenic disturbance; ecological and statistical distributions; abundance estimates; measures of location, dispersion and shape; response variables; frequency distributions of ecological variables; sample sizes, sample errors, statistical estimates of the samples, observational and manipulative experiments.
3	Training classes in the computer room. How to assess ecological variability. Building a database. Graphical methods: x-y diagrams, histograms, error bars
3	Training classes in the computer room. Computer simulations and case-studies on experimental designs, sampling procedures, uni- and multivariate analyses. BACI designs
3	Training classes in the computer room. Computer simulations and case-studies on crossed and hierarchical factorial designs in ecology; Multivariate and univariate case studies. Meta-analysis