UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2016/2017
BACHELOR'S DEGREE (BSC)	NATURAL AND ENVIRONMENTAL SCIENCES
SUBJECT	ENVIRONMENTAL BIOMONITORING
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50171-Discipline ecologiche
CODE	01662
SCIENTIFIC SECTOR(S)	BIO/03
HEAD PROFESSOR(S)	NASELLI FLORES LUIGI Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**NASELLI FLORES LUIGI** Monday 10:30 11:30 Studio del docente, Via Archirafi, 28 - I piano Wednesday 10:30 11:30 Studio del docente, Via Archirafi, 28 - I piano Friday 10:30 11:30 Studio del docente, Via Archirafi, 28 - I piano

DOCENTE: Prof. LUIGI NASELLI FLORES

PREREQUISITES	A basic knowledge of General Ecology is required
LEARNING OUTCOMES	Acquiring knowledge and comprehension abilities The goals of the class is to get critical tools aimed at (i) identifying and selecting the most suitable bioindicators in the different ecosystems and in accordance to the purposes of biomonitoring, (ii) selecting most significant environmental parameters and (iii) to choice the most suitable sampling frequency. Setting of biomonitoring protocols sized both on the environmental characteristics of the ecosystems and on the biological traits of target organisms. Ability to apply knowledge and comprehension Ability to autonomously build a biomonitoring protocol sized on specific environmental features to be investigated. Ability to illustrate both graphically and orally the results achieved. Judgement autonomy The course is aimed at developing a basic knowledge to evaluate the implications deriving from the selection of variables and the general results achieved through a monitoring program. Ability to analyse the results coming from a biomonitoring assessment. Communication skills The course will promote the ability to explain and sustain operative choices according to the legal context and to the environmental features. In addition, the ability to underline the importance and the necessity to monitor and control environmental characteristics even in (apparently) unimpacted ecosystems. Learning skills The course is aimed at developing the ability to critically analyse specialised scientific literature on the topics of the course. It is also aimed at facilitating the study required in a second-level degree or master course.
ASSESSMENT METHODS	Oral exam is scheduled at the end of the course. The exam is addressed toward ascertaining the ability to determine the ecological status of a given ecosystem through the choice and the analysis of selected biondicators
EDUCATIONAL OBJECTIVES	According to the "manifesto" of the degree course "Scienze della Natura e dell'ambiente" the final target of the course "Biomonitoraggio ambientale" is to give to students a good knowledge on contents and methods pertaining environmental control through a biological assessment. The goal is to reach the basic knowledge to program and develop biomonitoring tools sized on the different ecosystem typologies.
TEACHING METHODS	Frontal lectures. Lectures will be given in English if the class includes foreign students or upon request of the students
SUGGESTED BIBLIOGRAPHY	Sartori, F. (a cura di), 1998. Bioindicatori ambientali. Fondazione Lombardia per l'Ambiente, Milano, pp. 376. Articoli su riviste internazionali selezionati dal docente. Papers from the international scientific literature selected by the teacher

SYLLABUS

Hrs	Frontal teaching
4	Introduction to the course. Definitions and protocols. How to analyse different matrices: soil, water, air. Analysis of the general features of ecosystems
4	Identification of factors determining spatial and temporal heterogeneity in an ecosystem. Development of a sampling protocol
4	Collecting and analysing data: number transformation and normalization. How to show data on a graph. Temporal series and XY graphs. Correlation coefficients and the significance. Analysis of data variability
4	Defining trophic state of an aquatic ecosystem. Main descriptors of trophic state. Introducing phytoplankton. Italian laws: 152/99. European Directive 2000/60: Water Framework Directive. Methods and mesurements of the main trophic state parameters: total phosphorus, chlorophyll a concentration, Secchi depth.
4	Spatial zonation of an ecosystem. Introducing spatial heterogeneity in an aquatic ecosystem: effect of light extinction and temperature gradients. Effets of Light and Temperature on the biological structure of an aquatic ecosystem. Peculiarities of Mediterranean aquatic ecosystems
4	Growth strategies of a natural population. C-S-R strategies. Morphological traits of phytoplankton. Measuring the main size and morphological descriptors of phytoplankton. Morpho-functional approach. Relationships between moprhological features and environmental characteristics
4	Relationships between resource availability (light and nutrients9 and dominant phytoplankton shapes. Synthetic environmental descriptors: zmix/zeu ratio. Relationships between phytoplankton morphology and environmental parameters
4	Introducing biodiversity and its use in the environmental biomonitoring. Intermediate Disturbance Hypothesis. How to measure biological diversity: alpha, beta and gamma diversity. Similarity indices. Diversity indices for finite and infinite populations. Shannon Index computation and its ecological meaning

SYLLABUS

Hrs	Frontal teaching
4	Harmful Algal Blooms (HAB). Main algal toxins. Ecological conditions favouring HAB. Early warning procedures. Case studies on Sicilian ecosystems
4	River ecology. River Continuum Concept. Autotrophy and Heterotrophy in lotic ecosystems. Ecological classification of rivers and use of macroinvertebrate as bioindicators. Benthic diatoms as biological indicators. IBE and its suitability to monitor rivers. Other indices

Hrs	Practice
4	Graphic methods to identify growth strategies. Use of bioindicators to identify the ecological state of an ecosystem.
4	Sampling methods. Development of a sampling protocol. Data acquisition in biomonitoring programs. Counting phytoplankton and assessing biomasses. How to use morpho-functional descriptors in ecological state assessments.
4	Data manipulation and their graphic rendering