UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze della Terra e del Mare
ACADEMIC YEAR	2019/2020
BACHELOR'S DEGREE (BSC)	NATURAL AND ENVIRONMENTAL SCIENCE
INTEGRATED COURSE	BIOMONITORING AND ENVIRONMENTAL LAW - INTEGRATED COURSE
CODE	19858
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	IUS/10, BIO/03
HEAD PROFESSOR(S)	NASELLI FLORES LUIGI Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	GULLO NICOLA Professore Ordinario Univ. di PALERMO NASELLI FLORES LUIGI Professore Associato Univ. di PALERMO
CREDITS	12
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	3
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**GULLO NICOLA** Monday 15:00 17:00 Dipartimento di Giurisprudenza - piano II, stanza n. 11 - Via Maqueda n. 172 - 90134 Palermo (per il mese di luglio) **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	Good high-school mathematical skills, good abilities in English reading and listening, and basic knowledge of general Ecology are necessary to fruitfully attend the course.
LEARNING OUTCOMES	Acquiring knowledge and comprehension abilities The goals of the class is to get critical and normative 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, rooted on the actual European and Italian normative framework, 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	A written exam is scheduled at the end of the course, eventually integrated by 2-3 specific questions. The exam is addressed toward ascertaining the knowledge on the Italian and European legislation pertaining the Environment protection, and evaluating the ability to determine the ecological status of a given ecosystem through the choice and the analyses of selected biondicators. The test allows to demonstrate i) a basic knowledge on the selection of bioindicators (which grants a score ranging from 18 to 23), ii) a deeper knowledge on how to use autoecological (populations, including their phenotypic plasticity) and sinecological (community) knowledge to perform an environmental assessment (which grants a score ranging between 24 and 27), and iii) a capacity to make projection on future ecological scenarios (which grants a score ranging between 28 and 30 with honours).
TEACHING METHODS	Environmental biomonitoring module: Frontal lectures (40 h) and practice exercise in the classroom and in the field (16 h). Environmental law module: Frontal lectures (48h). Lectures will be given in English upon request of the students.

MODULE
ENVIRONMENTAL BIOMONITORING

Prof. LUIGI NASELLI FLORES

SUGGESTED BIBLIOGRAPHY

Articoli su riviste internazionali selezionati dal docente saranno forniti all'inizio del corso. Gli articoli consentiranno agli studenti di approfondire tutte le conoscenze acquisite in aula. La lista degli articoli e' modificata/aggiornata anno per anno in relazione alle nuove conoscenze acquisite.

Papers from the international scientific literature selected by the teacher will be given to students at the beginning of the course. The papers will allow the students to deepen all the knowledge received in the classroom. According to the new knowledge achieved internationally on the different subjects of the course, the list of papers is updated year by year.

AMBIT	50171-Discipline ecologiche
INDIVIDUAL STUDY (Hrs)	94
COURSE ACTIVITY (Hrs)	56

EDUCATIONAL OBJECTIVES OF THE MODULE

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.

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 the different 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 measurements 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 natural populations. C-S-R strategies. Morphological traits of phytoplankton. Measuring the main size and morphological descriptors of phytoplankton. Morpho-functional approach. Relationships between morphological 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.
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
8	Data manipulation and their graphic rendering.Graphic methods to identify growth strategies. Use of bioindicators to identify the ecological state of an aquatic ecosystem.
8	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.

MODULE
ENVIRONMENT LAW

Prof. NICOLA GULLO

SUGGESTED BIBLIOGRAPHY	
Gianpaolo Rossi, Diritto dell'ambiente, Giappichelli, Ultima edizione o Paolo dell'Anno, Diritto dell'ambiente, Cedam, Ultima edizione e Filippo Salvia, Cristian Bevilacqua, Manuale di diritto urbanistico, Cedam, 2018	
AMBIT	50172-Discipline agrarie, chimiche, fisiche, giuridiche, economiche e di contesto
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48
EDUCATIONAL OBJECTIVES OF THE MODULE	
Basic knowledge of the source of law system, of the constitutional framework relating to local authorities, of the administrative law, of the real rights law, general obligations and contracts law	

SYLLABUS

Hrs	Frontal teaching
4	Allocation of function between state and regions on planning law
8	Urban planning
6	Building permits
6	Principles of international environmental law
6	Division of the powers between the EU and states in environmental policies
2	Principles of European law
2	Environmental protection in the Italian Constitution
2	Division of powers between state and regions on the environment
4	Environmental law
6	Environmental assessments
2	Environmental Liability