
Testi del Syllabus

Resp. Did. **TRETIACH MAURO** **Matricola: 005263**

Docenti **CANDOTTO CARNIEL FABIO, 3 CFU**
TRETIACH MAURO, 3 CFU

Anno offerta: **2024/2025**
Insegnamento: **942SV - BIOMONITORING FOR ENVIRONMENTAL CHANGE DETECTION**
Corso di studio: **SM58 - ECOLOGIA E SOSTENIBILITÀ DEI CAMBIAMENTI GLOBALI**
Anno regolamento: **2023**
CFU: **6**
Settore: **BIO/01**
Tipo Attività: **B - Caratterizzante**
Anno corso: **2**
Periodo: **Primo Semestre**
Sede: **TRIESTE**



Testi in italiano

Lingua insegnamento

English

Contenuti (Dipl.Sup.)

A world that changes and that has always changed?

The factors of change: (a) physical factors: temperatures, precipitation, extreme phenomena; (b) land use change: urbanization, desertification, habitat fragmentation, de- and reforestation; (c) pollution of water, air and soil matrices; (d) moving of plant species in a changing world. Monitoring of environmental changes on a scientific basis: the problem of the temporal frame.

The "basic" of Biomonitoring: why use organisms? The concept of species, species niche, and ecological indicator values, with practical examples. Identification of groups of sensitive organisms such as environmental sentinels.

Specific disciplines for reconstruction of past and future changes: palinology, dendro- and coral chronology; phenological changes in populations and plant communities at a geographical level; miss matches among interdependent species.

Pollution as alteration of the chemical composition of environmental matrices. The use of organisms and organic matrices for the detection of pollutants. Biomonitoring of airborne pollutants based on mosses, lichens and vascular plants.

Evaluation of the functioning at the level of plant communities and ecosystems: what to measure, how and why. Analysis of the dynamics of carbon and nutrient exchanges in the soil-ecosystems-atmosphere system and monitoring methods at different scales.

Testi di riferimento

Selection of scientific papers and reviews put at disposal in moodle

Obiettivi formativi

The course aims to provide the methodological basis for the interpretation of biological data in the study of global changes. Knowledge and understanding:

- Acquire solid knowledge on issues related to the characterization of environmental changes and the pros and cons of different approaches, with particular emphasis on biomonitoring techniques, in particular on the use of organisms as environmental sentinels.

Acquisition of a critical mood for the interpretation of complex phenomena. Capability to critically read and understand scientific papers. To be able to plan a biomonitoring survey of air pollution, knowing the pros and cons that might be encountered in the realisation phase.

Ability to apply knowledge and understanding

Students, also through group activities, will be able to choose, apply and interpret the results of experimental protocols, consult databases and web-sites dedicated to environmental control.

Judgment Autonomy

This is developed through participation in the discussions during the lessons and through the preparation for the exam, which requires the individual re-elaboration and assimilation of the material illustrated by the teacher, as well as the writing of a short document (generally 6-8 pages) on specific topics for which in-depth studies were agreed in the students' cohort.

Communication skills

The discussion at lesson and specific corrections to the written documents will be used to improve the scientific vocabulary and learn to give reasons in support of each student's thesis.

Learning ability

This is stimulated by the intersection between the knowledge deriving from the lectures, as well as by the critical reading of the applied experimental protocols and from the requests to propose solutions to the scientific problems presented from time to time by the teacher, which illustrates numerous case studies by detailing them on the basis of scientific articles.

Prerequisiti

Basic knowledge of ecology, botany, zoology, environmental chemistry.

Metodi didattici

Lectures with the aid of Power Point slides; seminars on specific topics; open discussions on single scientific papers. Recordings of the lessons are available for a maximum of one year.

Any changes to the methods described here, necessary to ensure the application of the security protocols related to the COVID-19 emergency, will be communicated on the websites of department, degree course and teaching course.

Altre informazioni

On the Moodle course website the following items will be available: detailed program of the course; ppt slides; a selection of short papers on specific topics and further unpublished, original texts; useful or recommended

websites links. Access is reserved for those enrolled in the course. All the materials to be discussed at lesson, and the presentations in ppt format are updated progressively and made available immediately within a few hours preceding the single lesson.

Modalità di verifica dell'apprendimento

Oral exam on the entire program of about one hour, with the first question by drawing lots for one of the lessons of the course. Presentation of three scientific papers selected by the student (and validated by the teachers) on topics pertinent to the course. The oral exam aims at assessing students' skills on using, effectively, appropriately and with specific language, the concepts learned in the course. The grading system applied is: (18-24): sufficient or fair knowledge of the subject, adequate mastery of the technical language; (25-27): good or very good knowledge of the subject, technical language proficiency, essential ability to connect the themes addressed during the course (28-30 with honours): excellent knowledge of the subject and technical language proficiency, autonomous critical and analytical skills, and ability to apply acquired knowledge to concrete scenarios.

Programma esteso

Presentation: Contents, organisation, and modality of the final exam. What is "Environmental Change"? a perspective ranging from past to future eras. the problem of the temporal frame. Physico-chemical factors that can change: climate (temperature, water availability, precipitation, extreme events etc.), pollution (xenobiotic substances in water, air and soil matrices), land use (urbanisation, habitat fragmentation, de- and reforestation etc.).

Why Biomonitoring of Environmental Change is needed? The "basics" of Biomonitoring: why use organisms? Definitions of species, species communities and populations, ecological niche, habitat, ecological indices or ecological indicator values, with practical examples. Identification of groups of sensitive organisms that act as environmental sentinels.

Methodologies for describing past climate changes using organisms:

- Paleo Palynology (introduction to palynological analysis and its classic and new applications - the basics assumptions of paleopalynology - time range - methods and dating - pros and cons - examples);
- Dendrochronology (basic assumptions - time range - methods, dating and examples);
- Coral chronology (time range - basic assumptions - methods, dating and examples);
- Paleobotany.

Biomonitoring of extant changes in biorhythms - The basic of phenology: historical origin, causes, informational content and possible consequences for the environment; biorhythm alteration in different groups of animals (e.g. birds, mammals, insects) and in plants. Phenological changes at plant population and communities' level; mismatches among interdependent species and possible evolutionary implications.

Biomonitoring of airborne pollutants - Pollution as alteration of the chemical composition of environmental matrices, with special emphasis on air pollution. National and European regulatory framework on air pollution. Why monitor air pollution with organisms? Identification of groups of sentinel organisms in the environment. Bioindication with lichens, tobacco etc. to study the effects of single pollutants or mixtures of pollutants. Bioaccumulation of persistent pollutants in lichens, mosses, vascular plants to study the distribution over space and time, and the intensity of depositions in environments around point, linear or multiple emission sources as compared to background deposition levels.

Evaluation of plant ecosystem functioning - Analysis of dynamics of carbon in the soil/ecosystem/atmosphere: Monitoring at different scales (3 hours); analysis of dynamics of nutrient and pollutant exchanges in the soil/ecosystem/atmosphere continuum: Monitoring at different scales.

Seminars by the students

Students will give a speech of 30 min. on topics they will have selected among the main arguments listed in this programme, according to the specific interest of each student, for which the teachers will have prepared a collection of selected papers. Each student will select three scientific papers whose contents will become the subject of a

presentation of c. ten to fifteen slides to be given in front of the class. The content will be discussed in advance with the teachers, and the arguments will be eventually integrated on the basis of the suggestions of the teachers. At the end of the oral presentation in front of the class, questions by the other students and the teachers will be made.

Obiettivi Agenda 2030 per lo sviluppo sostenibile

This course explores topics closely related to one or more goals of the United Nations 2030 Agenda for Sustainable Development (SDGs), namely nr. 11-15.

Obiettivi per lo sviluppo sostenibile

Codice	Descrizione
11	Città e comunità sostenibili
12	Consumo e produzione responsabili
13	Agire per il clima
14	La vita sott'acqua
15	La vita sulla terra



Testi in inglese

	English
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Obiettivi per lo sviluppo sostenibile

Codice	Descrizione
11	Sustainable cities and communities
12	Responsible consumption and production
13	Climate action
14	Life below water
15	Life and land