UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Ecology

2021-2-E3201Q076

Aims

The course provides basic knowledge of general and applied ecology. The main objective of the course is the knowledge of the structure and functionality of the ecosystems, where the different species interact each other and with the surrounding environment. Particular emphasis is given to human interactions, given the value of the impact that our species has on the ecosphere.

Particularly the following education objectives are planned

Knowledge and understanding
Knowledge of the relationships between organisms and environment; quantitative analysis of ecological systems. Knowledge of the impacts of human activities on ecosystems.

Knowledge and applied understanding
Knowledge, understanding and application of the main methodologies useful for assessing the quality status of ecosystems.

Autonomy of judgment
Through the acquisition of the concepts of ecology and applied ecology, the student will increase his judgment and choice autonomy in the selection of strategies for environmental protection.

Communication skills
During the lessons, the student will be invited to take an active part in the lesson by discussing the topics covered in class. This will improve communication skills in public.

Ability to learn
The course will improve the student's learning skills in the interpretation of natural phenomena, disturbance and stress of natural or anthropic origin.

Contents

Contents:

General Ecology: Energy fluxes and material cycling in the ecosystems. Primary and secondary productivity. Trophic chains. The biogeochemical cycles. Population responses as a function of environmental factors. Exponential and logistic growth of populations. Reproductive strategies. Interactions among populations in the biological communities. The concept of ecological niche.

Applied ecology: Human activities and environmental damage. Environmental quality criterion. Organic pollution of surface water. Eutrophication of lakes and marine coastal water. Changes of river hydrology. Effects of toxic chemicals on ecosystems. Ecological effects of soil and air pollution. Greenhouse gas emissions. Acid rain. Ozone layer depletion. Ecological parameters and quality indices. Global contamination. Chemical and biological monitoring.

Detailed program

General ecology:

The multidisciplinary nature of Ecology and the study of the relationships between organisms and environment.

The physical environment: climate, aquatic and terrestrial environment.

The organisms and the environment: ecological genetics, adaptations and natural selection.

Populations: properties and growth of populations; metapopulations.

Populations: life history.

Intraspecific population regulation.

Metapopulation

Species interactions, population dynamics and natural selection.

Interspecific competition, parasitism and mutualism.

Community ecology

Community ecology (structure and dynamics of community, factors influencing the communities)

Ecosystem ecology (ecosystem energetics, decomposition and biogeochemical cycles).

The role of biodiversity in ecosystems. Factors of changes in biodiversity.

Terrestrial ecosystems. Ecoregions. Biomes.

Inland water ecosystems. The seasonal cycle in lakes. The functioning of rivers and the “river continuum” concept.

Marine ecosystems, biotic and abiotic conditions. Coral reef and Kelp prairies. The Mediterranean Sea.

Applied ecology:

Human activities and environmental damages.

Macro and microcontaminants. Ecological effects of urban and industrial settlements, agriculture, animal farms, energy production.

The concept of admissible load.

Examples of environmental problems at the local and global scale and effects on aquatic and terrestrial ecosystems.

Organic pollution: BOD and COD. Eutrophication of lakes and marine coastal waters. The mass balance model for eutrophication management.

Morphoedafic indices. The control of eutrophicatin. Measure and estimation of nutrient loads.

Hydromorphological changes of rivers.

Effects of oil pollution.

Atmospheric pollution. Effects of greenhouse gases, acid rain, ozone layer reduction.

Effects of soil pollution.

Global pollution from persistent organic pollutants.

Environmental quality criteria in international regulations.

Chemical and biological monitoring for environmental quality assessment.

Bioindicators. Biological indices. The Extended Biotic Index (EBI) and the river macrozoobenthos. Biological monitoring planning. Quality maps. Field studies.

Sustainability and Ecological footprint.

The concept of “Planetary Boundaries” for global environmental changes.

Prerequisites

Basic knowledge of mathematics, chemistry, physics and statistics, as well as of botanical and zoological subjects.

Teaching form

- Lessons recorded asynchronously (in addition, periodic webex meetings are scheduled with students for any clarifications on the lessons delivered)

- The teaching methods may vary following the evolution of the health situation.

Textbook and teaching resource

Smith and Smith – *Elementi di Ecologia* - Pearson Editore

Ricklefs R. E., 1999, L'economia della natura, Zanichelli, Bologna;

Odum E. P., Barrett 2006, Fondamenti di Ecologia, Piccin, Padova

Miller G.T. , 2001, Scienze Ambientali, EDISES, Napoli

slides

Semester

annual

Assessment method

Oral examination at the end of the course. No partial tests during the course period are planned. The evaluation criteria during the exam will consist in the verification of the acquisition of competences by the student of the topics treated by the teacher during the lectures (related to the program of general ecology and applied ecology). The questions will aim to ascertain the acquisition of basic notions and to evaluate the understanding of the ecological concepts, the ability to link the different topics covered.

mark range 18-30/30

Office hours

by arrangement writing an email to antonio.finizio@unimib.it