UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Ecology

2223-2-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 with each other and with the surrounding environment. Furthermore, the causes of the crisis in the relationship between man and the environment are explored.

Particularly the following educational objectives are planned

**Knowledge and understanding
Knowledge of the relationships between organisms and environment; quantitative analysis of ecological systems.

**Knowledge and applied understanding
Knowledge, understanding, and application of the main methodologies useful for studying the ecosystems.

Autonomy of judgment
Through the acquisition of the concepts of ecology, the student will increase his abiltià in the comprehension of ecosystem functions

**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, and ecosystems functions

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. Biodiversity

Applied ecology: Human activities and environmental damage. Organic pollution of surface water. Eutrophication of lakes and marine coastal water. Effects of toxic chemicals on ecosystems. Ecological effects of soil and air pollution. Greenhouse gas emissions. Acid rain. Ozone layer depletion. Measuring biodiversity and ecological quality. 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

Lectures
• Environmental problems: their causes and sustainability
• Examples of environmental problems on a local and global scale and effects on aquatic and terrestrial ecosystems.
• Chemical and physical contamination of the environment: Macro and micro contaminants
• Organic contamination of surface waters (BOD, COD and Eutrophication). The mass balance model for the management of lake eutrophication. Theoretical and experimental estimation of nutrient loads.
• Global chemical contamination. The problems of contamination by persistent contaminants.
• Origin and ecological effects of the contamination of the atmosphere. Greenhouse gas emissions. Acid rain. Reduction of the ozone screen.
• Origin and ecological effects of soil contamination.
• The concept of environmental quality criteria and its application in national and European regulations.
• Measuring Biodiversity and the ecological quality of ecosystems (Shannon Index; Simpson Index; IBE: Ex****tended Biotic Index; Lichen of biodiversity Index; Macrophytes Index).

Laboratory activities
• : application of indicators for the measurement of biodiversity and ecological quality

Field activities
• collection of environmental data

Prerequisites

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

Teaching form

- Lectures

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

Sustainable Development Goals

CLEAN WATER AND SANITATION | AFFORDABLE AND CLEAN ENERGY | RESPONSIBLE CONSUMPTION AND PRODUCTION | CLIMATE ACTION | LIFE BELOW WATER | LIFE ON LAND