UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# COURSE SYLLABUS

# Geopedology

**2627-3-E3201Q079**

## Aims

- Knowledge of soil and its main characteristics, including key physical parameters (thickness, rock fragments, texture, bulk density) and chemical parameters (pH, organic carbon, carbonates, cation exchange complex), as well as pedogenetic factors and processes and the basic principles of the most widely used soil classification systems (WRB and Soil Taxonomy).
- Ability to carry out a simplified soil description in the field, perform the main analytical determinations in the laboratory, and conduct a simplified classification of a soil profile.
- Ability to apply the acquired knowledge to contexts and samples different from those analyzed during the course.

## Contents

- Soil as an environmental and productive resource; ecosystem services provided by the soil
- Soil description.
- Main physical and chemical soil parameters.
- Factors of soil formation.
- Pedogenetic processes.
- Main soil taxonomic classification systems.
- Soil laboratory analysis.
- Soil-landscape relationships.

## Detailed program

Lessons

- Definition of soil; its environmental, agricultural and forestry importance; ecosystem services it provides.
- The soil profile and horizons; morphological description of the soil and denomination of genetic horizons.
- Main physical (thickness, rock fragments, texture, density) and chemical (pH, organic carbon, carbonates, exchange complex, fertility elements) soil parameters.
- Factors of soil formation: climate and pedoclimate, living organisms (vegetation, pedofauna, anthropic action), terrestrial relief and geomorphology, parental material and lithology, time and lenght of processes.
- Pedogenetic processes: addition, subtraction, mixing, transfer, transformation. Main processes: brunification, leaching, calcification, salinization, podzolization, vertisolization, gleying. Characteristics of the most widespread soil taxonomic classification systems: World Reference Base for Soil Resources (FAO) and Soil Taxonomy (USDA). Diagnostic horizons and methods of classification of a soil profile.

Laboratory

- Main laboratory determinations: sample preparation, pH, texture, carbonates, organic carbon, organic matter, cation exchange capacity, exchangeable cations, available phosphorus, aggregate stability, infiltration rate.

Field activities

- Two excursions for the description of natural soils and the study of soil-landscape relationships: the soils of the plain and of the recent morainic.

## Prerequisites

- Prerequisites: basic knowledge of inorganic chemistry, lithology and mineralogy, geomorphology; this knowledge will be considered already acquired.

## Teaching form

- 18 lectures of 2 hours each, held in person, consisting of expository teaching
- 1 laboratory activity of 4 hours, held in person, consisting of interactive teaching
- 2 laboratory activities of 3 hours each, held in person, consisting of interactive teaching
- 1 field activity of 5 hours, held in person, consisting of interactive teaching

## Textbook and teaching resource

Educational material distributed:

- Slides projected during the lessons: made available on the e-learning website.
- Laboratory analysis methods: made available on the e-learning website.
- Material for field activities: made available on the e-learning website.

Recommended texts for further information:

- Blume W., Schad P., Nortcliff S. (2018) Essentials of Soil Science. Borntraeger Science Publishers, Stuttgart.

- Certini G., Ugolini F. (2021) Basi di Pedologia. Edagricole, Bologna (available at the Bicocca Library of Sciences).
- FAO (2006). Guidelines for Soil Description, FAO, Rome (available online).
- Giordano A. (1999). Soil Science. UTET, Turin (available at the Bicocca Library of Sciences).
- IUSS Working Group WRB (2022). World Reference Base for Soil Resources. International Union of Soil Sciences (IUSS), Vienna, Austria. (available online).
- Previtali F. (2000). Elements of Geopedology. Genesis and geography of soils. CUEM, Milan (available at the Bicocca Library of Sciences).
- Weil R.R., Brady N.C. (2017). The Nature and Properties of Soils. Pearson, Harlow, England.


## Semester

First semester

## Assessment method

Written exam with optional oral exam.

The written exam includes open-ended questions (very short essays or analysis of problems) and closed answer questions (multiple choice answers), related to all the topics covered in the course (lectures, laboratories, field activities); the text is evaluated in thirtieths (20/30 in total for open-ended questions; 10/30 in total for closed answer questions). Upon request of the student or teacher, the written exam can be supplemented by an oral exam (related to all the topics covered in the course), carried out by means of verification questions. The outcome of the oral exam can lead to an increase or decrease of maximum 4 points of the grade of the written exam (therefore, it is possible to be admitted to the oral exam when the grade of the written exam is at least equal to 14/30). There are no intermediate tests.

## Office hours

On appointment

## Sustainable Development Goals

CLIMATE ACTION | LIFE ON LAND