UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Urban Water Cycle

2526-1-F7603Q022-F7603Q02201

Aims

The teaching of the first module 'Urban Water Cycle' of the laboratory course aims to enable students to understand the principles and methods that allow:
• sustainable management of industrial water in the natural or urban environment;
• sustainability assessment of water abstraction;
• sustainability assessment of wastewater discharge.

The topics of this module are closely related to some aspects of the second module 'Service Management', and the teaching will, where necessary and beneficial for the general understanding of the interrelationships of the aspects taught, see incorporation of parts of the second module.

The students are invited to consult the syllabus of the entire course for details regarding learning- and skill-related objectives.

Contents

• Anthropogenic and urban water cycle, water balance.
• Groundwater recharge and discharge, groundwater renewability and sustainability.
• Surface water environmental flow, surface water/groundwater interactions, groundwater-dependent ecosystems.
• Hydro-biogeochemical processes affecting the quality of freshwater resources.
• Wastewater treatment and environmental impacts.

Detailed program

• Alteration of the natural water cycle by anthropogenic and urban activities, water supply and sewerage networks.
• Major sources of freshwater to meet industrial needs.
• Groundwater recharge and discharge, groundwater balance, groundwater recharge rates and renewal time.
• Groundwater renewability, sustainability of groundwater abstractions, managed aquifer recharge.
• Problems related to groundwater over-exploitation in a changing climate.
• Interactions between groundwater and surface water, base flow and environmental flow, groundwater-dependent ecosystems.
• Hydro-biogeochemical processes, pollution and contamination of water resources.
• Wastewater treatment technologies, environmental impacts of wastewater discharge.

Prerequisites

• Basic knowledge of hydrochemistry.
• Basic knowledge of hydrogeology.

Teaching form

3 CFUs of mixed theoretical and practical lessons in the classroom (30 hours):
• 10 two-hour lectures, in person, Delivered Didactics;
• 5 two-hour lectures, in person, reading and discussing case studies, Interactive Teaching.

Attendance to lectures and interactive exercises is highly recommended.

Textbook and teaching resource

• Mace R. (2022). Groundwater Sustainability - Conception, Development, and Application. Springer Nature, Berlin. DOI: https://doi.org/10.1007/978-3-031-13516-3.
• Slides and selected scientific papers made available on the e-learning website of the course.

Semester

II semester (March - June)

Assessment method

The final examination will take the form of an oral interview. There will be a single oral interview for both modules due to their close interconnection. The oral interview is structured in two parts:
• a first part in which the student will expose, by means of presentation with slides, the results of an assignment involving the critical analysis of a case study (duration of the presentation 10-15 min); in this part, the ability to critically understand, expose and communicate a scientific text will be evaluated;

• a second part of discussion, with 2-4 questions, on the topics covered by the two modules of the course (duration of 20-30 min); in this part the degree of knowledge acquired and the ability to apply the interpretative tools acquired will be evaluated.

The final score will be between 18/30 and 30/30 *cum laude*, based on the overall assessment considering the following criteria:
(1) knowledge and understanding;
(2) ability to connect different concepts;
(3) autonomy of analysis and judgment;
(4) ability to correctly use scientific language.

Office hours

Always, after scheduling an appointment *via* e-mail.

Sustainable Development Goals

QUALITY EDUCATION | CLEAN WATER AND SANITATION | INDUSTRY, INNOVATION AND INFRASTRUCTURE | SUSTAINABLE CITIES AND COMMUNITIES | RESPONSIBLE CONSUMPTION AND PRODUCTION