UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Fundamentals of Hydrogeology

2425-1-F7401Q075-F7401Q078M

Aims

Provide skills about: the characteristics of soils and rocks that control subsurface water storage and circulation; estimation of groundwater reserves and renewable water resource; surface and deep water relationships; data acqiusition and monitoring techniques; groundwater hydrochemistry; characterization and analysis of the source regime; construction of intake and catchment works; characterization of aquifers with flow tests for the determination of aquifer hydraulic parameters. Ensure learning with exercises for the purpose of applying analytical and/or numerical solutions for the analysis of tests and estimation of parameters of porous media, including for complex boundary conditions.

Contents

Students will learn basic knowledge on hydrogeology, applied and contaminant hydrogeology, treatment of contaminated sites
Hydrogeologic Concepts:

Groundwater flow principles
Aquifer characterization and classification
Darcy's Law and groundwater flow equations
Transient and steady-state flow
Groundwater recharge and discharge
Groundwater-surface water interactions
Aquifer Testing and Analysis:

Pumping tests (e.g., slug tests, constant-rate tests)
Analysis of aquifer properties (e.g., hydraulic conductivity, specific yield)
Aquifer test design and interpretation
Well hydraulics and well efficiency

Detailed program

Fundamentals of hydrogeology

Basic Hydrogeologic concepts:
Hydrologic cycle and water circulation in different geological systems. Hydrogeological balance: rainfall, temperature, real and potential evapotraspiration. Porosity definitions and use. Fluid flow in saturated and unsaturated soil, porous rocks or jointed rocks. Reconstruction and interpretation of piezometric surfaces and flow nets. Classification and analysis of springs, spring discharge regime, evaluation of spring discharge dynamics using recession curves, Hydrochemistry: physical chemical properties of groundwaters, TDS, dissolved elements their origin and their effects, data representation, plotting and analysis. .
Aquifer testing and analysis:
Well design and installation, drilling and construction techniques, purging, maintenance, materials. Monitoring and interpretation of well hydraulic testing and pumping tests under steady state and transient conditions. Well sampling techniques and problmes, methods and materials, sampling campaigns. Applying site characterization to model development.

Risk analysis for soil and water contamination. Reference legislation: regional, national and european laws for superficial and subsurface water.

Lab exercises: Flow net construction, simple solution of water flow in porous media, interpretation of well tests.

Prerequisites

A base-level knowledge in engineering geology, site investigation, physics and mathematics is required

Teaching form

- Lessons

- Laboratory experiences and problem solving

Textbook and teaching resource

All the lectures are downloadable form the elearning website

Semester

1st and second semenster

Assessment method

Oral

Office hours

Sustainable Development Goals

CLEAN WATER AND SANITATION