UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Groundwater Modeling and Management

2627-2-F7503Q026

Aims

The course aims to convey to the student of Sciences and Technologies for the Environment and the Territory

- knowledge of the basic principles of hydrogeological modeling, 2D and 3D
- the ability to study and quantitatively analyze complex hydrogeological situations for an hydrogeological and hydrochemical characterization
- the ability to develop a work project
- the ability to develop autonomous analysis of situations, developing project proposals

At the end of the course the student is able to

- Model quantitatively simple and complex hydrogeological structures
- Rebuild maps distributed by point data
- Produce hydrogeological forecast scenarios

At the end of the course the student has acquired a judgment autonomy that allows him to analyze a complex environmental hydrogeological problem, carry out a modeling and write a technical report, as happens in a real work situation.

During the course a learning ability is acquired that can be applied to the application of the knowledge acquired in contexts that are also different from those studied during the course, typical of the world of work.

Contents

The course is aimed at the study of environmental hydrogeological problems, through an applicative approach through the use of IT tools, functional to the world of work.

The course includes a theoretical and a practical part and retraces the workflow necessary to reach a hydrogeological and hydrochemical characterization of a real case study, developing the complete work path: exploratory analysis and data mapping, geostatistical reconstruction of piezometric maps , hydrodynamic and hydrochemical characterization and 2D and 3D flow and advective transport modeling.

Detailed program

The course takes place entirely in a computer lab where theoretical and practical parts will take turns to guide the student in the application of several computational tools
In particular

- basic tools for exploratory analysis and data mapping
- software for the reconstruction of an experimental variogram of hydrogeological data;
- reconstruction of piezometric with application of experimental variograms;
- statistical tools for hydrochemical analysis of data
- bi-dimensional hydrogeological models to compute and draw flow lines and well capture zones;
- three-dimensional hydrogeological models for groundwater flow simulation in the saturated zone, under natural conditions and modified by the impact of human impact.
- Exercises are planned with applications to real cases of hydrogeological problems.
- hydrogeological models of advective, dispersive and degradation contamination transport
  Exercises with applications to real cases of modeling problems are foreseen, in which the student must analyze different scenarios, variable according to the uncertainty of the data and of the project scenarios.

Prerequisites

Knowledge of the basic concepts of flow hydrogeology

Teaching form

The course will take place in a computer lab, with a teaching mixed between theory and practice.

- 24 hours of delivered and and interactive teaching, alternating during the lesson, (3 CFU).
- 30 hours of interactive teaching (LIBaaS Lab) using real cases, (3 CFU).

The teachers explain a theoretical part, using real case studies, which is immediately applied in the classroom by the students through work tools, encouraging collaboration between students, development of ideas on the best ways to address the proposed environmental problem, analysis of environmental and economic sustainability to identify the best solution.

Textbook and teaching resource

Book - Anderson M. P., Woessner W.W. 1992. *Applied groundwater modeling.* Academic Press, 381 pp.

Teacher resources (https://elearning.unimib.it/course/view.php?id=57735)

Semester

Second semester

Assessment method

The exam consists of a written test in the form of a PROJECT WORK.

Students have to face a real complex hydrogeological project, retracing when developed during the course, demonstrating that they have acquired mastery and competence of the processing tools.
The delivery are two papers, developed using the software seen in class.

The mark of the project is out of thirty and is supplemented by an oral test, chosen by the student, who can support if he has passed the project part with at least 18/30.

Office hours

Apointment, by email to tullia.bonomi@unimib.it

Sustainable Development Goals

CLEAN WATER AND SANITATION