

Name of the module: Flow and Contaminant Transport modelling in the unsaturated zone

Number of the module: 001.2.5006

BGU Credits: 3

ECTS credits:

Academic year:

Semester:

Hours of instruction: 3 / week

Location of instruction: Class

Language of instruction: English

Cycle:

Position:

Field of Education: Soil, geology and environment science

Responsible department: The Zuckerberg Institute for Water Research

General prerequisites: no prerequisites

Grading scale:

Course Description:

Climate and land use changes (e.g., urbanization, agricultural land, revegetation, industry) affect the global water, carbon, and nitrogen cycles and introduce contaminations into the environment. Therefore, the quantification of these processes is crucial. This course provides a theoretical background on the physical processes governing water and solute movement in the unsaturated zones of soil and rock. Various approaches and tools for quantifying flow and transport processes in these zones will be explored.

Aims of the module:

To provide a theoretical background on the physical processes governing water and solute movement in the soil and rock unsaturated zones.

Objectives of the module: To quantify basic physical processes that govern the unsaturated water flow and solute transport

Learning outcomes of the module:

On successful completion of this course students will be able to:

1. Understanding the governing factors that facilitate flow and transport in the unsaturated zone
2. Familiarized with the various approaches that quantify the water flow and solute transport in the unsaturated zone.

Attendance regulation: obligatory, at least 80% attendance

Teaching arrangement and method of instruction: in class

Lecturer:

Contact details: Tuvia Turkeltaub

Office phone: +972-52-6137442

mail: tuviat@bgu.ac.il

Office hours:

In coordination with the lecturer

Module evaluation: at the end of the semester the students will evaluate the module, in order to draw conclusions, and for the university's' internal needs

Confirmation:

Last update: August 2024

Assessment:

1. Three assignments during the semester (50%)
2. Final home exam (40%)
3. Participation in lectures (10%)

Work and assignments:

1. Three short assignments during the semester
2. A final take-home exam where students choose a modeling task from a provided list.

Module Content\ schedule and outlines:

- Introduction to the unsaturated zone
- Physical Properties of unsaturated zone
- Principles of water flow in the unsaturated zone
- Exploring analytical and numerical solutions for water flow in the unsaturated zone
- Solute transport mechanisms in the unsaturated zone
- Exploring analytical and numerical solutions for solute transport in the unsaturated zone
- Sink terms
- Model calibration, validation, and application to case studies
- Preferential flow – case studies and conceptual approaches

Additional literature: Bibliography of the module.

The course texts are scientific articles that the instructor will supply.

*** All learning material will be available to the students on the module's website/ library/ electronic documents available to BGU students.**