Course Name:
Applied Ground-Water Flow Modelling

Course Number:
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Credit:
3

Course Content (outline):

- Introduction
  - The purpose of modelling
  - The proper use of models
  - Constructing a Numerical Model
  - Numerical methods for groundwater models
- Governing Equations
  - Darcy’s Eq.
  - General GW continuity Eq.
  - Transport Eq.
- The Finite Difference Method
  - Approximation of the derivative
  - Solution of the Flow Eq.
  - Transient Flow
  - The Alternating direction technique
  - Block-Centered finite differences
  - Stability
- The Finite Element Method
  - Basic Principles
  - Galerkin Method
  - Solution of the Flow Eq.
  - Anisotropy and Heterogeneity
  - Comparison with finite difference method
  - Confined/Unconfined aquifers
- Solution of the transport Eq.
  - Advection processes
  - Diffusion and dispersion processes
  - Mass transport equation,
  - FDM and FEM for Solution of the transport Eq.
  - Numerical dispersion
  - Particle tracking methods
- Model Applications
  - Model application process
  - Defining Goals
  - Building a flow and contaminant transport model
  - Model input parameters
- Model Calibration and Sensitivity Analysis
  - Basic concepts of model calibration
  - Assessment of model calibration
  - Calibration by trial and error
  - Automated calibration
  - Sensitivity analysis
- Dealing with uncertainty
  - Types and sources of uncertainty
  - Methods of evaluating uncertainty
  - Managing uncertainty
- Case studies

References: