

## **Civ. E. 676 Case Studies in Groundwater Management**

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### **Course Description**

The objective of the course is the development of skills required to model groundwater systems. The topics covered include data interpolation and extrapolation methods: inverse square method, least squares, kriging; the use of numerical and analytic models in the assessment of groundwater flow and contaminant migration; the description of saturated and unsaturated multi-dimensional groundwater flow models and their attributes and limitations. Conservative and non-conservative solute transport models. The modelling of multi-phase flow, dissolution and volatilization processes. The development of conceptual models and the application of boundary conditions to field scale problems. The use of sensitivity and uncertainty methods including adjoint techniques, monte carlo and latin hypercube sampling. Waste disposal and spill site case studies. Models to be used in the course include the US EPA kriging program **GEOPACK** or equivalent, the three-dimensional groundwater flow model **MODFLOW**, the contaminant transport models **MOC** and **MT3D**, **HELP 3**, and several analytic models.

### **Assignments**

A mark for the course will be based on submitted assignments and a project. There will be strict deadlines for the assignments of the course. Programming skills are an asset. Earth Sci 650 or equivalent is a prerequisite.

**Lectures:** Monday, 11:30 – 12:50, E2-3356

Thursday, 11:30 – 11:20, E2-3356

**Course Notes:** Notes will be distributed throughout the term at cost.

**THE FIRST LECTURE FOR THIS COURSE WILL BE HELD Monday, Jan. 6 at 11:30**