

Course Contents:

The Soil System: Physical properties of soil; soil water potentials, soil water characteristic curves and pedo-transfer functions; spatial variability of soils and scaling issues; Water Flow in Soils: Bernoulli's, Poiseuille's and Darcy's Laws; unsaturated hydraulic conductivity models; Richards equation and its alternate forms; Solutions of Richards equation: Analytical, approximate and numerical solutions of Richards equation, stability of numerical schemes, numerical dispersion, multi-dimensional water flow: spherical and cylindrical sources; introduction to Hydrus software for solving multidimensional flow problems; Solute Transport in Soils: Solute concentrations; transport mechanisms; transfer functions and stream-tube models; mobile-immobile systems; Heat Transport in Soils: Soil thermal properties; Fourier's law; steady and unsteady state transport equations and boundary conditions