Announcement of special course in summer semester 2014

Introduction to Fundamentals of Hydrodynamic Modeling in Porous Media

Gustav-Meyer-Allee 25, 13355 Berlin - TIB 13b, Room 566

This course strives to provide physical and mathematical background to construct models for the simulation of flow and transport phenomena in heterogeneous media. The fundamental balance equations will be investigated both in micro and macro scales. The detailed course content is presented below:

Lumped Parameter approach:

Microscopic Continuum approach:
A) Integral and differential microscopic balance equation. C) Eulerian and Lagrangian forms of the general balance PDE D) General form of boundary conditions, leading to Dirichlet, Neumann and Cauchy forms E) Example of constructing the Eulerian and the Lagrangian phase momentum balance equations. F) Re-formulating continuum PDE into lumped parameters ODE, for 2D component mass balance equation and the general phase extensive quantity balance equation.

Macroscopic, Volume Averaged, Continuum approach:
A) Volume averaging rules over a Representative Elementary Volume (REV). B) General balance equation for phase or component extensive quantity. C) Concurrent general extensive quantity balance equations at the primary REV scale and its secondary at the adjacent scale significantly smaller than that of the REV one. Examples: Component mass balance primary equation at the REV scale and its concurrent secondary mass balance equation at the adjacent scale significantly smaller than that of the REV; Momentum balance equation of a phase at the REV length scale and the its secondary balance equation at adjacent much smaller spatial scale. D) Modeling Examples: 1: Stress in saturated porous media; 2: Mass transport of a single fluid in saturated deformable porous matrix. E) Selected Topic: Shock wave driven solute transport with compressible fluid flow through saturated deformable porous matrix.

The course “Introduction to fundamentals of hydrodynamic modeling in porous media” (1 SHW = 1.5 ECTS), is offered at the TU Berlin as a part of the competence field hydrosiences in the master's degree in Civil Engineering. It is part of the module Modeling Hydro-and Environmental Systems II and it also suitable for the students from Geo-, Environmental and Natural Sciences. The course is offered in cooperation with the Ben-Gurion University of the Negev, Israel and with the Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin.

Dates: Wednesday 30.07.2014 10:00 till 12:30 and 13:30 till 17:00
Thursday 31.07.2014 10:00 till 12:30 and 13:30 till 17:00

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