

5.0 credits	30.0 h + 22.5 h	2q
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Teacher(s) :	Vanclooster Marnik (coordinator) ; Lambot Sébastien ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	<p>This course aims at initiating students to the modelling of water and solute transfer in heterogeneous, saturated or unsaturated media, at the scale of the pedo-geologic formation. More specifically, this course aims at : - reviewing the concepts of water and solute transfer in unsaturated heterogenous media and aquifers; - present the various approaches for the mathematical modelling of water and solute transport in soils and aquifer (analytical, numerical and transfer function approaches), - explain the functioning of advanced techniques for the hydrodynamic characterization of soils and aquifers; - initiate students to the use of numerical resolution tools of the water and solute transfer equations; - train the student to team work for the resolution of a realistic hydrodynamic problem.</p>
Aims :	<p>At the end of the courses and practicals, the students will be able to :</p> <ul style="list-style-type: none"> <li>- understand the hydrodynamic functioning of soils and aquifers</li> <li>- apply the water and solute transfer equations to steady and unsteady flow in saturated and unsaturated media</li> <li>- interpret the behaviour of an aquifer during a pumping test</li> <li>- interpret the breakthrough curve in terms of the main processes affecting solutes during their transfer in a soil column</li> <li>- master the functioning principles of advanced techniques for the characterization of soil hydrodynamic properties</li> <li>- solve complex problems through the use of simulation models and field measurements.</li> </ul> <p><i>The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".</i></p>
Content :	<p>This course presents the equations of water and solute transfer in saturated and unsaturated media : Richards equation, convection-dispersion equation with degradation, adsorption, mobile-immobile water, etc. A lot of emphasis is placed on different approaches for the resolution of these equations (analytical, numerical and transfer function), as well as advanced methods for the characterization of hydrodynamic properties and solute concentrations : GPR and SAR radar, magnetic induction, inverse modelling, etc. Preferential flow of water and its impact on solute transport will be presented. Finally, the hydrodynamic characteristics of aquifers and the principles and interpretation of pumping test for the characterization of aquifer properties will be discussed. The main concepts presented during the course will be illustrated during the practicals : tension infiltrometer, use of numerical models for direct or inverse modelling in 1 (soils) and 2 (dams) dimensions of water and solutes in saturated / unsaturated media. Finally the students will present a 20 min. seminar on a theme of their choice related to the course.</p>
Other infos :	<p>Precursory courses Soil science, soil physics, transfer phenomena</p> <p>Evaluation Evaluation is based on the seminar, a report on the practicals, open-book resolution of exercises, and the interpretation of a breakthrough curve.</p> <p>Support Handbook, educational software, book or article excerpts.</p>
Cycle and year of study :	<p> <a href="#">&gt; Master [120] in Agricultural Bioengineering</a>  <a href="#">&gt; Master [120] in Chemistry and Bio-industries</a>  <a href="#">&gt; Master [120] in Environmental Bioengineering</a> </p>
Faculty or entity in charge:	AGRO