UCLouvain

lbres2103

2020

Soil physics applied to Agronomy and Environment

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

4 credits	30.0 h + 15.0 h	Q1

Teacher(s)	Bielders Charles (coordinator) ;Javaux Mathieu ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	- Characteristics of a porous medium - Water retention and water potential in soils - Flow of water in saturated and unsaturated media - Techniques for characterizing water content, water potential and hydraulic conductivity - Introduction to solute transfer - Transfer of gas and heat in soils - Soil Mechanics
Aims	a. Contribution de l'activité au référentiel AA (AA du programme) M1.2 ; M1.4 ; M2.2 ; M2.3 ; M2.4 ; M6.5 ; M6.8 b. Formulation spécifique pour cette activité des AA du programme At the end of the course, the student will be able to: - Explain the factors that determine the physical properties of soil - Master the basic techniques of characterization of soil physical properties - Explain the impact of soil physical properties on the retention and flow of water, the transfer of gas, heat and dissolved substances, and mechanical properties of soils 1 - Establish the profiles of total water potential from baseline data - Establish the basis for modeling the dynamics of soil water in space and time, and applying Darcy's equation to estimate steady water flow - Associated with a given type of soil, depending on texture and structure, the physical properties that correspond to it, and interpret soil physical data - Describe the principle of operation, advantages and disadvantages of conventional methods and instruments used for the characterization of soil physical properties - Extract soil samples in situ and characterize the basic hydraulic properties in the laboratory - Write a report according to scientific standards and critically and consistently analyze results - Contribute effectively to collegial data acquisition, analysis and writing of the results and conclusions. - - - - *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".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Report of practicals (40%) Oral exam based on solving of exercises (written preparation) (40%) Oral exam based on 3 theoretical questions (no préparation) (20%)
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** - Classes, largely illustrated by photos, schematics and exercices - Inverted classrooms, based on Videos from the MOOC 'L'eau et le sol' (in French) (water retention and flow in soils) - Practicals in the lab and in the field - Exercise solving sessions - Feedback on practicals report around mid-semester
Content	Lectures : - Reminder regarding the characteristics of a porous medium - Retention of water in soil, capillarity, water retention, hysteresis

	- Potential of water in soils: gravitational, matrix, hydrostatic, overburden, osmotic, barometric potential - Techniques for characterizing water content and water potential - Water flow in soils under steady saturated and unsaturated conditions : laws of Poiseuille, Darcy Equation and Richards equation - Techniques for characterizing the hydraulic conductivity curve - Equation of water transport in soil: Examples of analytical solutions - Introduction to solute transport in soils - Transfer of gas and heat in soil : processes - Mechanical properties of soils , compaction, and characterization techniques Practicals : - Sampling of soil - Measurement of bulk density - Measurement of infiltration : constant head infiltrometer and permeameter - Characterization of the water retention curve - Calculation of water potentials - Calculation of water balance
Inline resources	Moodle MOOC "L'eau et le sol"
Bibliography	Ouvrage de référence : - "Environmental Soil physics", D. Hillel - Transparents des cours sur iCampus - MOOC "L'eau et le sol" (EDX)
Other infos	This course can be given in English.
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Agricultural Bioengineering	BIRA2M	4		
Master [120] in Forests and Natural Areas Engineering	BIRF2M	4		
Master [120] in Environmental Bioengineering	BIRE2M	4		
Master [120] in Chemistry and Bioindustries	BIRC2M	4		
Master [120] in Agriculture and Bio-industries	SAIV2M	4		