lbres2103

2024

Soil physics applied to Agronomy and Environment

4.00 credits	30.0 h + 15.0 h	Q1

Teacher(s)	Bielders Charles (coordinator) ;Javaux Mathieu ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	General knowledge in soil science : texture, structure, composition, etc.
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
Learning outcomes	**At the end of this learning unit, the student is able to :** 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 - 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.
Evaluation methods	Report of practicals (40%) Oral exam based on solving of exercises (written preparation, 2h, open-book - computer not allowed) (40%) Oral exam based on 3 theoretical questions (no préparation, questions available before the exam via Moodle) (20%)
Teaching methods	- 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
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)
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Civil Engineering	GCE2M	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		
Master [120] in Agricultural Bioengineering	BIRA2M	4		