

Faculty of Agricultural and Food Sciences, Department of Soil Science, University of Manitoba
Physical Properties of Soils (SOIL 4060)
Winter 2021 Course Information and Schedule

General Course Objective	Senior undergraduate students will have an understanding of physical properties of soil, will be able to measure these properties and are able to relate soil physical properties to soil processes and plant growth.
Prerequisites	Soils and Landscapes in our environment (SOIL 3600), Transport Phenomena (BIOE 2110).
Course Duration	January 18, 2021 to April 16, 2021.
Course Credits	3
Class Hours	<p>Classes will be recorded.</p> <p>Remote Learning link:</p> <p>Mondays, Wednesdays, Fridays: 9:30 am -10:20 am Join Zoom Meeting https://zoom.us/j/93115905845?pwd=UTRIWFVKQzdHMIHQVNVVGNMNWpNQT09 Meeting ID: 931 1590 5845 Passcode: 8XBF0X One tap mobile +13017158592,,93115905845#,,,,*294538# US (Washington D.C) +13126266799,,93115905845#,,,,*294538# US (Chicago)</p> <p>Dial by your location +1 301 715 8592 US (Washington D.C) +1 312 626 6799 US (Chicago) +1 346 248 7799 US (Houston) +1 646 558 8656 US (New York) +1 669 900 9128 US (San Jose) +1 253 215 8782 US (Tacoma) Meeting ID: 931 1590 5845 Passcode: 294538 Find your local number: https://zoom.us/u/ayohgvBK9</p> <p>Thursdays: 2:30-5:25</p> <p>Join Zoom Meeting https://zoom.us/j/93115905845?pwd=UTRIWFVKQzdHMIHQVNVVGNMNWpNQT09 Meeting ID: 931 1590 5845 Passcode: 8XBF0X One tap mobile +13017158592,,93115905845#,,,,*294538# US (Washington D.C) +13126266799,,93115905845#,,,,*294538# US (Chicago)</p>

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Contact information	
Instructor: Dr. Afua Adobea Mante Department of Soil Science, University of Manitoba	Email: Afua.Mante@umanitoba.ca Office Hours: Send an email to set up appointment. Location: Remotely
Teaching Assistant: Takudzwa Nawu Department of Soil Science, University of Manitoba	Email: nawut@myumanitoba.ca

Other information	
Voluntary Withdrawal Date:	March 31, 2021
Last Day of Classes	April 16, 2021
Winter Term Final Exam Period	April 19 to May 1, 2021
Holiday and Closures	February 15, 2021 (Louis Riel Day); February 16 to February 19, 2021 (Winter break); April 2, 2021 (Good Friday)
Textbook	<ul style="list-style-type: none"> • Environmental Soil Physics - Daniel Hillel -Academic Press (On reserve at the Ag. Library) • Introduction to Environmental Soil Physics - Daniel Hillel - Academic Press (On reserve at the Ag. Library) • Soil Physics - Agricultural and Environmental Application - H. Don Scott - Iowa State University Press. • Introduction to Soil Physics - Daniel Hillel - Academic Press • Soil Physics - (Sixth Edition) - W.A. Jury, and Robert Horton - John Wiley & Sons • Soil Physics (3rd edition) - T.J. Marshall, J.W. Holmes, and C.W. Rose - Cambridge University Press • Soil Physics - L.D. Baver. W.H. Gardner, and W.R. Gardner - John Wiley & Sons. • Soil Physics with Hydrus - Radcliffe and Simunek
Course Web Site	UMLearn

Course Assessments	
Class Assignments (10)	25%
Midterm 1	15%
Midterm 2	15%

Final Exam	45%
Grading Scale for Course	
Letter Grade	Percentage out of 100
A+	≥ 90
A	80 - 89
B+	75 - 79
B	70 - 74
C+	64 - 69
C	55 - 63
D	46 - 54
F	≤ 45
Late assignments	Assignments are due one week after they are assigned. Assignments submitted after the due date will be deducted 10% per school day. Assignments will not be accepted after providing feedback.
Attendance and Participation	You are required to attend all classes and to complete all of your assigned readings and assignments. Always notify me if you are unable to attend class.
Classroom and email conduct	Your full attention is requested during lectures and all class discussions. In accordance with university policy, all email communication for this course shall be conducted using your University of Manitoba email address only.
Copyright/ Academic integrity	Students do not have ownership rights to materials developed for the course. Posting or any other means of publishing these materials is prohibited. Refer to link below to know more about academic integrity at the University of Manitoba: https://umanitoba.ca/student-supports/academic-supports/academic-integrity
Course Details	Subject to change

Lectures

Overview of Soil

- What is soil Physics
- Essence of soil; Soil as three-phase system; Soil profile; Soil profile and soil formation
- Basic relationship among soil phases

Assignment 1

Soil solid phase

- Characterization of soil solid phase: Soil texture; Particle size distribution; Specific surface

Assignment 2

- Nature and behaviour of clay: What is clay; Structural unit of clay; Types of clay; Properties of Clay: Electrostatic double-layer concept; Cation exchange capacity; Hydration, swelling and shrinkage; Dispersion and flocculation
- Soil structure: Application of soil structure; Types of soil structure; Aggregated soil structure; Factors that influence aggregation; Vulnerability of aggregates; Aggregate size distribution

Assignment 3

Midterm 1

Soil liquid phase

- Hydrological cycle
- Soil water: Essence of soil water; Expressing soil wetness; Soil wetness determination

Assignment 4

- Energy state of soil water: Soil-water potential; Components of soil-water potential; Soil-moisture characteristic curve

Assignment 5

- Flow of water in soil: Flow of water in saturated soil; Flow of water in unsaturated soil; Measurement of hydraulic conductivity.

Assignment 6

Soil Aeration

- Essence of soil aeration; movement of soil gases; causes of impeded aeration; impact of impeded aeration
- Characterizing soil aeration
- Gas transport in soil: Convection; Diffusion

Assignment 7

Midterm 2

Soil Temperature

- Essence of soil temperature; Factors that influence soil temperature; Determination of soil temperature

Heat Transfer in Soil

- Heat transport processes; Heat transfer mechanisms in soil; Thermal properties of soil; Management of soil heat

Assignment 8

Entry of Water into Soil

- Infiltration; Mode of water supply; Factors that influence infiltrability; Profile moisture distribution during infiltration; Methods for measuring infiltration; Equations for infiltrability

Assignment 9

Soil Water Availability to Plants

- Plant need for soil water; Available soil water; Factors that influence soil water availability

Assignment 10