Soil 4510 Soil and Water Management

Course Syllabus
Fall 2021

Course Calendar Description:
Topics include capability of land for agriculture; storage, movement and use of water; saline and alkaline soils; soil conservation including erosion; sustainability of soil organic matter; effect and fate of soil amendments. 3 credit hours. Prerequisite: SOIL 3600.

Instructor:
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Teaching Assistant:
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Time and Location:
Lectures and labs will be offered online and synchronously (live), via Webex within UM Learn. Lectures will be delivered Mondays, Wednesdays, and Fridays from 8:30-9:20, and laboratories/tutorials will take place on Wednesdays from 2:30-5:20. Students are expected to attend all lectures and laboratories/tutorials. The synchronous delivery will allow discussions between instructor and students during lectures and laboratories/tutorials. Regularly scheduled lectures and laboratories/tutorials will provide for steady progress towards course objectives and learning outcomes.

Class Communication:
The instructor will attempt to open class meetings 15 minutes before their scheduled start and extend them 30 minutes past their scheduled end to facilitate individual and group discussions with students. Outside of these meetings, students can contact instructors by email, and instructors will attempt to respond within 48 hours. Students' questions and concerns about course content will be addressed at the start of the next class meeting. Individual telephone meetings with the instructors can be arrange by appointment.

Course materials and emails will be delivered by the instructors to the class via UMLearn. The Subject line of emails from students to the instructor must start with "**SOIL 4510**, **Last Name**, **topic**….."

General Course Information:
SOIL 4510 is a required course in the Agronomy program in the Faculty of Agricultural and Food Sciences and a restricted elective in other programs in the faculty.

Any person studying agriculture, agroecology, environment or geography will benefit from an improved understanding of soil and water management issues. Agriculture is a significant industry in Canada. All agricultural practices have both strengths and weaknesses for both production potential and environmental impact. The issues are complex and require detailed knowledge in order to arrive at informed decisions about the benefits or detriments of specific management

practices. This course is designed to promote critical thinking about agricultural production, limiting factors, agricultural sustainability and environmental impacts. These topics are especially relevant in light of increased public awareness and criticism of agriculture, food production and their environmental impacts.

Intended Learning Outcomes:
At the completion of this course, the student should be able to:
1. explain relationships among soil, water and air as they relate to environmental quality and agriculture in western Canada,
2. interpret soil, landscape and climate data for the purpose of identifying potential environmental impacts on agricultural productivity and management practices,
3. design a water management plan for a specific farm and explain the rationale for the design in written form,
4. pass the Soil & Water Management section of the Prairie Province Certified Crop Advisor exam.

Course Materials:
The lecture slides are available for students to download from the UM Learn course page. Each student is expected to download these slides and have them for reference during class. The PowerPoint slides constitute the primary study material for the class. No textbook is required. Some reading materials will be provided to supplement the lectures for some course topics.

Recording Lecture and Laboratory Presentations:
The course instructor and the University of Manitoba hold copyright over the course materials, presentations and lectures that form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission from the course instructor. Course materials (both paper and digital) are for the participant's private study and research.

Student Responsibilities:
The lecture slides contain the material for the course. Each student is expected to download these slides from the course UM Learn page prior to the class for which they will be covered and have the slides for reference during that class. Students are also expected to supplement the material on the slides with their own notes from the lectures. The purpose of making the slides available ahead of class is to facilitate learning the course material and to provide an opportunity for interactive class sessions.

Review questions are provided at the end each section of lecture slides and are intended to assist students by testing their knowledge of course material prior to the quizzes and final exams. Students are expected to study the review questions on their own and seek clarification prior to the quizzes or final exam on any material that they do not fully understand.

Learning Methods:
The class is taught lecture-style with student involvement and interaction during class periods. The lab exercises and the term project are designed to provide opportunity to apply concepts taught in class and a practical perspective to the subject material.

Laboratory assignments are designed to be completed during the laboratory session and handed in the following Friday. They will be graded and returned the following week. Each student should ensure they have access to the lecture slides during the lab to facilitate applying the concepts from

the lectures. Laboratory assignments will utilize resource material compiled specifically for each exercise. There are a number of packages of resource material for the lab exercises. Students should work in ad hoc groups of 4 or 5 and share the resource material but each student should prepare and submit their own individual laboratory assignment.

For the class term project, students will work in pre-assigned groups to do a specified assessment. All students in the group will work jointly on the project and receive the same grade for the calculations, risk assessment and oral presentation.

Experts from industry and government will provide guest lectures to students and will have direct input to students in both laboratory exercises and the term project.

Course Evaluation:
Student performance will be based on weekly quizzes, laboratory assignments, a term project and a final exam. Each Friday a short quiz will be given to ensure students are keeping up with the course materials. Quizzes will consist of short questions in multiple choice format. There will be no mid-term exam this year; hence, the quizzes. There will be 11 quizzes and the best 10 quizzes will be counted towards the final grade. Lab assignments will be distributed on the Monday before the Wednesday laboratory, and they must be submitted on the Friday following the laboratory. There will be five laboratories and five laboratory assignments. A group project will be carried out over the course of the term and submitted by the end of the term. There will be a final exam based on the entirety the course content.

Weekly Quizzes	20%
Laboratory Assignments	20%
Term Project	20%
Final Exam	40%

Grading:
Standard grading procedures will be applied.

Numeric Grade	Letter Grade
90 – 100	A+
80 – 89	A
75 – 79	B+
70 – 74	B
65 – 69	C+
60 – 64	C
50 – 59	D
< 50	F

Assignment Submission Policy:
<u>Late Assignments</u>
Laboratories must be submitted on the Friday following the laboratory in order to accommodate timely feedback of grades and comments. If students know beforehand that they will not be able to attend a laboratory session, they should contact the instructor to make alternate arrangements to complete it.

Individual term project reports handed in after the due date and time will lose 10% of the grade for each day late.

Missed Assignments

Students who do not submit a laboratory assignment will receive a grade of zero. Missed laboratory exercises cannot be made up after the graded reports have been returned. Those students who do not submit an individual term project report will receive a grade of zero for that portion of the term project.

Missed Quizzes

If students know beforehand that they will not be able to attend a quiz, they must contact the instructor to make alternate arrangements ***prior to the quiz***. Students who miss a quiz without notice will receive a grade of zero on the quiz.

Class Schedule

Sections	Approximate Number of Lecture Periods
Introduction	1
Section 1. The Agricultural Climate Resource - climatic limitations for crop production in western Canada - frost-free days, growing degree days, crop heat units, - precipitation, climate probability and risk - soil moisture, evapotranspiration, soil water balance	4
Section 2. The Agricultural Land Resource - agricultural land in Canada - soil maps and reports, map scale - prairie soil orders and agriculture - soil capability classification for agriculture - agricultural productivity, target yield - crop yield-moisture-N interaction - landscape impacts on productivity	5
Section 3. Soil Management - tillage equipment, practices and systems - prairie soil management issues - soil organic matter - soil structure	5
Section 4. Water Management - water movement and water cycling - prairie water quality issues - surface water, riparian zones - subsurface water - management for soil moisture surplus and deficit - drainage and irrigation	5
Section 5. Nutrient Management - nutrient movement, nutrient cycling - fertilizer use, nutrient balance - nutrient uptake and removal - management of nutrients in manure - 4R nutrient management	4
Section 6. Soil and Water Issues - drainage of agricultural land, suitability, water quality - irrigation of agricultural land, suitability, water quality - water, wind and tillage erosion risk factors and management - soil salinity/sodicity – causes and management - soil acidity, lime requirement	12

Laboratory Periods:
The laboratory periods will be used for both laboratory exercises and term project work as per the schedule below.

September 8	Term Project – Introduction and Coordination
September 15	Term Project – Field Exercise #1: Study area selection and Characterization
September 22	Lab 1 – Calculation and Interpretation of Climatic Risk
September 29	Term Project – Field Exercise #2: Study area and field site reconnaissance and characterization
October 6	Lab 2 – Interpreting Land Resource Information
October 13	Term Project – Field Exercise #3: Study area and field site reconnaissance and characterization
October 20	Lab 3 – Land Use and Environmental Planning
October 27	Term Project – Field Exercise #4: Study area and field site reconnaissance and characterization
November 3	Lab 4 – Soil Quality Issues – Soil Conservation Planning
November 10	Fall Term Break / Term Project Catch Up
November 17	Term Project – Field Exercise #5: Conservation assessment
November 24	Lab 5 – Water Quality Issues – Water Conservation Planning
December 1	Term Project – Field Exercise #6: Conservation assessment
December 8	Term Project – Write up

Important Dates:

September 8 First Day of Classes
October 11 Thanksgiving Monday
November 11 Remembrance Day Monday
November 8-12 Fall Term Break
November 23 VW deadline
December 10 Last day of classes