SOIL 503
ADVANCED FIELD AND LABORATORY METHODS IN SOIL SCIENCE

TERM 2 – 2009/10

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Lectures: Friday @ 10 – 11 am (MCML 260)

Labs: Thursday @ 1 - 4 pm (MCML 102A)

Course Description:
Application of fundamental field and laboratory measurement procedures and techniques in soil science.

Course Learning Outcomes:
Upon completion of SOIL 503 students will be able to**:**

- Develop a proper field sampling plan and calculate basic statistics that describe the variability and accuracy of the measurements.
- Measure fundamental soil physical properties and states
- Measure fundamental soil chemical properties
- Measure fundamental soil biological properties
- Analyse, interpret, and summarize laboratory and field measurement data for selected soils in a final written report.

Course Format:
SOIL 503 will be run in conjunction with AGRO 403, with SOIL 503 students participating along with advanced undergraduate students to meet the course learning outcomes listed above.

The course learning outcomes will be met through various lab exercises and field visits. A study site will be chosen and sampled during the course, with the samples prepared and stored for later analysis. Each week, laboratory measurements will be made (or initiated) or additional field measurements will be done. The students will operate either individually or in pairs (depending on the exercise). Each student will prepare lab reports for each laboratory session. Class meetings each week will consists of a one-hour lecture and two- (to three) hour lab session.
There will be no textbook for the course and background readings will be drawn from a variety of sources.

Course Marks:

Laboratory reports	75%
Final summary reports for soil chemistry, biology, and physics sections*	15%
Presentation + extended abstract on a specific method	10%

*Three final interpretive summary reports will be prepared by individual students and will be assessed on the basis of content and quality of writing. Final reports should characterize the soil on a broad scale and in context of particular designated applications.

Lab Schedule

Date	Lecture / Lab activity	Instructor(s)
Jan 7	Course overview, review of basic concepts of soil science	All
Jan 8	Lecture: Organic matter, electrical conductivity	Brown
Jan 14	Lab: Organic matter content (loss on ignition and LECO) Electrical conductivity (saturation paste)	Brown
Jan 15	Lecture: Cation exchange capacity	Brown
Jan 21	Lab: Cation exchange capacity (CEC) and exchangeable cations - Ca, Mg, K, and Na (ammonium acetate extraction)	Brown
Jan 22	Lecture: pH, Available P, micronutrients	Brown
Jan 28	Lab: Soil pH Available phosphorus (Bray P-1 method) Available micronutrients – Cu, Zn, Fe, Mn (DTPA-TEA extraction)	Brown
Jan 29	Lecture: Bacteria and fungi	McArthur
Feb 4	Lab: Isolation of bacteria and fungi	McArthur
Feb 5	Lecture: Bacteria and fungi	McArthur
Feb 12	Lab: Isolation of bacteria and fungi - continued	McArthur
Feb 13	Lecture: Soil fauna	McArthur
Feb 15 – Feb 26	Olympic break (Feb 15-26, 2009) – no labs or lectures	
Mar 4	Lab: Soil fauna	McArthur
Mar 5	Lecture: Soil respiration	Novak
Mar 11	Lab: Measurements of soil respiration (chamber or other methods)	Novak
Mar 12	Lecture: Soil bulk density and water content	Novak
Mar 18	Lab: Field sampling of soil bulk density (core method) and water content (gravimetric) with a stratified random design	Novak
Mar 19	Lecture: Particle size	Novak
Mar 25	Lab: Particle size (sieving, hydrometer, hand texturing)	Novak
Mar 26	Lecture: Aggregate stability, plastic limits	Novak
Apr 1	Lab: Aggregate stability (wet sieving) Plastic limits (Atterberg apparatus)	Novak
Apr 2	Lecture: Hydraulic conductivity, infiltration	Novak
Apr 8	Lab: Field hydraulic conductivity (auger hole method) Infiltrability (tension infiltrometers, ring infiltrometers)	Novak
Apr 9	Lecture: Soil water, matric potential, penetration resistance	Novak
Apr 15	Lab: Profiles of field soil water content (Time Domain Reflectometry) Matric potential (tensimeters) Soil penetration resistance (penetrometer)	Novak
Apr 16	Presentations by Graduate students registered in SOIL 503	Grad. Students

General Reference on Soil Lab Methods:

Brady, N.C. and R.R. Weil. 2002. The nature and properties of soils. 13th edition. Pearson Education Inc. [*General reference on soil science, available on reserve in Woodward Library*]

Carter, M.R. 1993. Soil sampling and methods of analysis. Canadian Society of Soil Science, Lewis Publ., Boca Raton, FL.

Dane, J.H. and G.C. Topp. 2002. Methods of soil analysis. Part 4 - Physical methods. Soil Science Society of America, Book Series No. 5. SSSA. Madison. WI.

McKeague, J.A. 1978. Manual of soil sampling and methods of analysis. 2nd edition. Canadian Society of Soil Science.

Page, A.L. 1982. Methods of soil analysis: chemical and microbiological properties. Part 2, 2nd edition. ASA-SSSA, Madison, WI.

Sparks, D.L. 1996. Methods of soil analysis. Part 3 - Chemical methods. Soil Science Society of America. Book Series No. 5. ASA-SSSA, Madison, WI.

SoilWeb. 2004. On-line teaching tool for the SOIL 200 course developed by Maja Krzic. http://www.landfood.ubc.ca/soil200 [*Quick overview of basic concepts of soil science*]

Westerman, R.L. 1990. Soil testing and plant analysis. 3rd edition. ASA-SSSA, Madison, WI.