APBI 403 / SOIL 503
SOIL SAMPLING, ANALYSES AND DATA INTERPRETATION

TERM 1 – 2015/16

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Lectures: Friday @ 1 – 2 pm (MCML 154)

Labs: Tuesday @ 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 APBI 403 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
- Interpret and summarize laboratory and field measurement data for selected soils in final written reports.

Course Format:
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 work 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:

	APBI 403 – Soil Sampling, Analyses and Data Interpretation	SOIL 503 – Advanced Soil Sampling, Analyses and Data Interpretation
Laboratory reports	60%	55%
Final summary reports for soil chemistry, biology, and physics sections*	40%	35%
Presentation + extended abstract on a specific method		10%

*****Each student will prepare a total of three summary reports. These reports will be assessed on the basis of content (i.e., data presentation and interpretation) and quality of writing. Summary reports should characterize the soil on a broad scale and in context of particular designated applications. All reports should be handed in on time and 10% mark subtraction will be made for each day being late.

2015 Schedule

Date	Lecture / Lab activity	Instructor(s)
Sep 11	Lecture: Course overview, review of basic concepts of soil science	Krzic
Sep 15	Lab: Data analysis tutorial	Brown
Sep 18	Lecture: Sampling design (mineral soils)	Brown
Sep 22	Lab: Sampling and sample preparation for mineral soils in Agriculture and Forestry	Brown
Sep 25	Lecture: Particle size	Brown
Sep 2	Lab: Particle size – quick method	Brown
Oct 28	Lecture: Soil bulk density and water content (Time Domain Reflectometry)	Brown
Oct 6	Lab: Field sampling of soil bulk density (core & excavation methods); water content (gravimetric, volumetric) & TDR	Brown
Oct 9	Lecture: Soil aggregate stability	Krzic
Oct 13	Lab: Soil aggregate stability	Krzic
Oct 16	Lecture: Organic matter, electrical conductivity	Krzic
Oct 20	Lab: Organic matter content (loss on ignition and LECO) Electrical conductivity (saturation paste)	Krzic
Oct 23	Lecture: Cation exchange capacity	Krzic
Oct 27	Lab: Cation exchange capacity (CEC) and exchangeable cations - Ca, Mg, K, and Na (ammonium acetate extraction)	Krzic
Oct 30	Lecture: pH, available P, micronutrients	Krzic
Nov 3	Lab: Soil pH Available P (Bray P-1 method) Available micronutrients – Cu, Zn, Fe, Mn (DTPA extraction)	Krzic
Nov 6	Lecture: Soil biodiversity	Grayston
Nov 10	Lab: Soil biological sampling (field) Extraction of soil macro- and meso-fauna from soil (Berlese funnels, visual identification).	Grayston
Nov 13	Lecture: Plant-microbe symbioses: Mycorrhizae and N-fixing root nodules	Grayston
Nov 17	Lab: Mycorrhizal fungi AM and ECM (% colonization and morphotyping). Nodules (Identification, N-fixation estimation using given acetylene reduction rates)	Grayston
Nov 20	Lecture: Soil biological functions and activity	Grayston
Nov 24	Lab: Enzyme assays (colorimetric microplate for B glucosidase, phosphatase, chitinase) Demonstrations: Micro Resp (C utilisation profiles using deep well microplates & CO_2 respiration) & molecular biology techniques	Grayston
Nov 27	Lecture: Soil respiration	Brown
Dec 1	Lab: Measurements of soil respiration (chamber or other methods)	Brown
Dec 4	Lecture: Perspectives	MK, SB, SG

* note, presentations by graduate students registered in SOIL 503 will be scheduled outside of class time

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*]

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

Coleman, D.C., D.A. Crossley and P.F. Hendrix. 2004. Fundamentals of Soil Ecology, 2nd Edition. Elsevier Academic Press, San Diego, CA, USA.

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.

Krzic M., T. Naugler, S. Dyanatkar, and C. Crowley. 2010. Virtual Soil Lab Modules. The University of British Columbia, Vancouver. [http://soilweb.landfood.ubc.ca/labmodules/]

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

Paul, E.A. 2015. Soil Microbiology, Ecology and Biochemistry 4th Edition. Elsevier Academic Press, San Diego, CA, USA.

Ruiz, N., P. Lavelle and J. Jiménez. 2008. Soil Macrofauna Field Manual: Technical level. Food and Agriculture Organization of the United Nations, Rome. ftp://ftp.fao.org/docrep/fao/011/i0211e/i0211e.pdf

Schinner, F., R. Öhlinger, E. Kandeler and R. Margesin (Eds) 2011. Methods in Soil Biology. Paperback edition. Springer-Verlag, New York.

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.

SoilWeb200. 2014. On-line teaching tool for the APBI 200 course developed by Maja Krzic. http://www.landfood.ubc.ca/soil200 [*Quick overview of basic concepts of soil science*]

Su, C., L. Lei, Y. Duan, K-Q. Zhang and J. Yang. 2012. Culture-independent methods for studying environmental microorganisms: methods, application, and perspective. Applied Microbiology & Biotechnology 93 (3): 993-1003.

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

Note on Academic Honesty:

Academic honesty is a core value of scholarship. Cheating and plagiarism (including both presenting the work of others as your own and self-plagiarism), are serious academic offences that are taken very seriously at the University of British Columbia. By registering for courses at the University of British Columbia, students have initiated a contract with the university that they will abide by the rules of the institution. It is the student's responsibility to inform themselves of the University regulations. Definitions of Academic Misconduct can be found on the following website:
http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,959#10894

If you are unsure of whether you are properly citing references, please ask your instructor for clarification before the assignment is submitted. Improper citation will result in academic discipline.