
FSTY 205 – Introduction to Soil Science

September 2007

Lectures & Tutorial: M,W,F 1630 – 1720 LAB8 8-166
Labs: L1: Wednesday, 800 - 1050 LAB8 8-231
L2: Thursday, 1500 – 1750 LAB8 8-231
L5: Tuesday, 1500 - 1750 LAB8 8-231

Instructor: Paul Sanborn	Office hours: Mon., 3:00-4:20 pm Fri., 2:00-3:20 pm (or by appointment)	Office location: 8-308 (Teaching Lab Bldg)
Office phone: 960-6661	E-mail: sanborn@unbc.ca	

Senior Lab Instructor: Ms. Chris Jackson	Office location: 8-241 (Teaching Lab Bldg)
Office phone: 960-6438	E-mail: cjackson@unbc.ca

Prerequisites - First year Chemistry: CHEM 100-3, 101-3, 120-1, 121-1

Course description – The core of this course is a basic introduction to the physical, chemical, and biological characteristics of soils – knowledge that is essential for stewardship of forest and agricultural lands, and environmental protection. Soil science is both a field and laboratory discipline, so this course emphasizes both the field study of soils, and the laboratory techniques used to characterize them.

Course objectives – Upon completion of this course, students should have a good understanding of:

- key chemical, physical and biological properties of soils
- the formation and pattern of soils in the landscape
- the Canadian System of Soil Classification (CSSC)
- terminology and methods used to describe and characterize soils in the field and laboratory
- soil-plant relationships; interrelationships between soils and land management practices
- the role of soils in environmental quality and sustainability

Evaluation of Student Performance:

Two mid-term exams @10% (Oct 12) & 10% (Nov 7)	20%
Final exam	30%
Laboratory reports and exercises (see lab manual for lab mark distribution)	50%
<hr/> Total	<hr/> 100%

A penalty of 10% per day will be deducted for late lab reports. Cheating and/or plagiarism will result in expulsion from this course. See page 64-65 of the 2007-2008 Undergraduate Calendar for full details on UNBC's policies regarding these and other academic offenses.

If there are students in this course who, because of a disability, may have a need for special academic accommodations, please come and discuss this with me, or contact Disability Services located in Room 1048, Teaching & Learning Centre.

Course Materials:

Lecture Notes:

- PDF versions of the Powerpoint lecture presentations will be available in the FSTY 205 course folder on the student G: drive (other materials, such as problem sets and solutions, and additional readings, will also be distributed in this way)

Lab Information:

- A *FSTY 205 Introduction to Soil Science Laboratory Exercises* manual will be given to you during the first lecture. It details important lab information. Appropriate clothing for outdoor field work, a Laboratory Safety Orientation Card or Decal, and a lab coat are required. Refer to the lab manual's "*Lab Schedule*" for details regarding when each of these are needed. Also read the "*Lab Policies and Procedures*" and "*General Instructions for Field Assignments 1 to 4*" (pages 1-30) prior to your first lab which start the second week of classes (Sept 10/07).

Note Regarding Field Work -- Labs 1 - 4:

Be prepared for cold, wet weather! Wear appropriate clothing (full length pants and shirts/jackets) and footwear (hikers or boots). Bring your lab manual. Our field experiences are designed to develop your skills in recognizing and describing soils in the field. Further important information about field and laboratory work is in the introduction to the lab manual. **Review this material before your first lab!**

Required Textbooks:

- Brady, N.C. and R.R. Weil. 2002. *The Nature and Properties of Soils*. 13th Edition. Prentice Hall, New Jersey

This general introductory soil science textbook contains information relevant to the forestry, agricultural, and environmental aspects of soils, and is a good background reference for further soils courses that you may take. Note that it is an American text, and therefore uses different terminology for designating soil horizons and classifying soils.

Additional Resources:

Books on Reserve in Library under FSTY 205:

- Soil Classification Working Group (1998). *The Canadian System of Soil Classification*. 3rd ed. Agric. Can. Publ. 1646. 164 pp.

[Full text also available on-line at: <http://sis.agr.gc.ca/cansis/taxa/cssc3/index.html>]
- Fisher, R.F. and D. Binkley. 2000. *Ecology and Management of Forest Soils*. 3rd ed. Wiley, Toronto.
- Valentine, K.W.G., P.N. Sprout, T.E. Baker and L.M. Lavkulich. 1978. *The Soil Landscapes of British Columbia*. Ministry of the Environment, Victoria, BC.

[Also available on-line at: <http://srmwww.gov.bc.ca/soils/landscape/index.html>]

On-line Resources:

- How to Describe Soil Profiles (Arocena & Pawluk) - useful supplement to lab manual
<http://web.unbc.ca/~quarles/nres/soc/profiles/slides.htm>
- Soils of Canada (Arocena and Abley) – photographs and descriptions of selected Canadian soils
<http://web.unbc.ca/~quarles/nres/soc/soc.htm>
- Soil Orders of Canada (video clips of soils and landscapes, mostly in BC):
<http://projects.oltubc.com/SOIL/homepage.htm>
- Pictures of Canadian soil landscapes:
<http://res.agr.ca/CANSIS/TAXA/LANDSCAPE/index.html>
- Soils and Plants of the Sub-Boreal Spruce (SBS) Biogeoclimatic Zone of the McGregor Model Forest (Arocena, Massicotte, and Driscoll)
<http://web.unbc.ca/~quarles/nres/soc/sbs/index.html>
- Soil Landscapes of the Northern Wetbelt (Sanborn)
<http://wetbelt.unbc.ca/soils-synopsis.htm>
- My web page – not very flashy, but there are pictures and publications about the research that I do:
<http://web.unbc.ca/~sanborn/>

Additional resource materials may be placed on reserve during the term.

FSTY 205: Outline and Schedule (Fall 2007)

(Note: Midterm dates are fixed, but there may be some change in the scheduling of specific lecture and tutorial topics.)

Week - Date	Monday	Wednesday	Friday
1 – Sept 3	Labour Day Holiday	Introduction	<i>Tutorial:</i> Basic chemistry review session
2 – Sept 10	Soil Genesis: soil forming factors	<i>Tutorial:</i> Basic mineralogy (silicate structures & composition)	Soil Genesis: weathering processes
3 – Sept 17	Canadian soil classification	Canadian soil classification (<i>continued</i>)	<i>Tutorial:</i> Soil classification practice exercise
4 – Sept 24	Physical properties (texture, bulk density, porosity)	Physical properties (compaction, Atterberg limits)	<i>Tutorial:</i> Soil physics problem-solving
5 – Oct 1	Soil water (roles, nature, content, energy relations, physical & biological classification)	Soil water (movement, infiltration)	<i>Tutorial:</i> Soil physics problem-solving & review session
6 – Oct 8	Thanksgiving Holiday	Soil aeration & thermal properties	MIDTERM #1
7 – Oct 15	Soil colloids (general, phyllosilicates, oxides, humus colloids)	Charge characteristics, cation exchange, anion exchange, adsorption	<i>Tutorial:</i> Soil classification exercise
8 – Oct 22	Soil reaction (acidity)	Soil reaction (alkalinity, salinity)	<i>Tutorial:</i> Soil chemistry problem-solving
9 – Oct 29	Soil organic matter (components, importance, decomposition, humification)	Soil organic matter (distribution in profiles, humus forms)	<i>Tutorial:</i> Soil chemistry problem-solving & review session
10 – Nov 5	Soil organisms (fauna, microflora)	MIDTERM #2	Soil organisms (food webs, ecological functions)
11 – Nov 12	Remembrance Day Holiday	Soil fertility and nutrient cycles: organic-bound (N, P, & S) vs. mineral-bound (K, Mg, Ca) nutrients; trace elements	<i>Tutorial:</i> Soil fertility problem-solving
12 – Nov 19	Soil fertility and nutrient cycles (<i>cont.</i>)	Soil fertility management and soil conservation in forestry	<i>(No tutorial)</i>
13 – Nov 26	Soil science in environmental remediation and land use	Soils and long-term environmental change	<i>(No tutorial)</i>
14 – Dec 3	Final review session / course evaluation [Last day of classes]		

FSTY 205 Recommended Readings

Unless otherwise noted, the chapter references are to Brady & Weil (13th edition). Additional readings may be assigned throughout the term. These readings are intended to amplify the material covered in the lectures by providing additional examples and alternate explanations of important concepts.

Introduction

- All sections in Ch. 1, *but* note that many horizon designations used in this text differ from those in the Canadian System of Soil Classification! Also, section 3.1, in Ch. 3.
- Article by Dan Yaalon (2000), “Down to earth: why soil – and soil science – matters.” (PDF file in course folder)

Soil Genesis & Classification

- Read section 2.17 first, then 2.1-2.16; omit 2.18; omit Ch. 3, except for section 3.1; Ch. 2.2 in Valentine *et al.* (1978) (on reserve). *Note that Brady & Weil is an American text, and therefore uses terminology for designating soil horizons and classifying soils that differs from that used in Canada.*

Physical Properties of Soils

- All sections in Ch. 4 (may not cover all of 4.8-4.9 in lectures).

Soil Water

- Sections 5.1-5.6, 5.8-5.11; Fig. 7.24 and related text in Ch. 7.

Soil Aeration & Thermal Properties

- Sections 7.1-7.11

Soil Colloids, Charge Characteristics, Cation & Anion Exchange, Adsorption

- Sections 8.1-8.11.

Soil Reaction, Acidity and Alkalinity, Salinity

- Sections 9.1-9.10 (may not cover all aspects of acid rain in 9.6); sections 10.1-10.5.

Soil Organic Matter

- Sections 12.1-12.4; 12.6-12.7; 12.11.

Soil Organisms

- Sections 11.1-11.7, 11.9-11.17 (may not cover all of 11.7, 11.14-11.16 in lectures)

Soil Fertility & Conservation in Forestry

- TBA

Soil Science in Environmental Management & Land Use

- Ch. 18