

## GGR 205 – Introduction to Soil Science - Revised July 2<sup>nd</sup> 2014

**INSTRUCTOR:** Jason Shabaga, MSc, (PhD Candidate)  
Department of Geography and Planning  
*Email:* [jason.shabaga@utoronto.ca](mailto:jason.shabaga@utoronto.ca)  
*Office:* Sidney Smith - Room 5060 (5<sup>th</sup> Floor)  
*Office Hours:* Tuesday and Thursdays, 12:00-1 pm

**LECTURES:** *Time:* Tuesday and Thursday 10:00 am – 12:00 pm  
*Location:* SS 2110 (Sidney Smith, 2<sup>nd</sup> floor)

**TEACHING ASSISTANT:** Carolyn Winsborough, (PhD Candidate)  
*Email:* [c.winsborough@mail.utoronto.ca](mailto:c.winsborough@mail.utoronto.ca)

**COURSE DESCRIPTION AND FORMAT:** Soils are a complex component of ecosystems that play a critical role in sustaining life for all terrestrial organisms. They support plants and soil organisms, recycle organic matter and nutrients, regulate global climate through the exchange of greenhouse gasses, and filter contaminants in water and waste. Soils also provide an invaluable role in sustaining human society and culture through agriculture, preservation of paleoecological and archaeological records, and providing materials for construction, art, and medicine. Without the services and resources provided by soils, terrestrial life and human society would cease to exist as we know it.

This course provides an introduction to soil science dealing with the chemical, physical, and biological properties of soils. We will explore these through the lens of soil formation and development, soil classification, and the application of soil science to agricultural, industrial, and urban settings. A strong focus will be given to environmental and forestry issues relating to soil science in the context of soil contamination, long-term fertility, and their role in regulating climate change.

**Recommended preparation:** CHM137Y1 or CHM138H1 and CHM139H1; GGR100 H1

\*\*Students do not require a post-secondary chemistry or biology background; however, the nature of this course presumes a basic understanding of organic and physical chemistry and plant and microbial biology. Due to the compressed nature of this course, we will not be able to provide an in-depth explanation of these concepts. Therefore, students without any background in these topics are strongly advised to consult with the instructor to ensure suitability.

### COURSE OBJECTIVES:

- 1) Learn the fundamentals of soil morphology, formation processes, and classification
- 2) Understand how soil chemical, physical, hydrological, and biological properties influence soil form, function, and classification.
- 3) Understand how soils influence, or are influenced by, ecosystem processes.
- 4) Explore soils in Canadian ecosystems (drawing on 1 and 2 above) including environmental changes that alter soil functioning.
- 5) Become familiar with reading relevant scientific literature and interpreting quantitative data.
- 6) Observe soils in the field and learn how to interpret them from the objectives listed above

**USE OF BLACKBOARD:** Course information, assignments, and links to any supplemental readings will be posted on the Blackboard system.

**TEXTBOOK:** Brady, N.C. and Weil, R.R. 2010. *Elements of the Nature and Properties of Soils*, 3<sup>rd</sup> Ed., Prentice Hall, New Jersey. ISBN 978-0-13-501433-2

Copies are available for sale at the bookstore and one (1) copy is on reserve at the Noranda Library.

**SUPPLEMENTARY TEXT:** The Canadian System of Soil Classification 3<sup>rd</sup> Ed. Agriculture and Agri-Food Canada (1998) ISBN 0-600-17404-9

Available online at: <http://sis.agr.gc.ca/cansis/publications/manuals/1998-cssc-ed3/index.html>

**ASSESSMENT:**

Assignment 1: 10%; Mid-term test: 25%; Assignment 2: 25%; Final examination: 40%

**Assignments:**

*Goals:* The assignments will be explained in-detail during class time the week before they are due, and will be due in-class, at the beginning of class. Only printed assignments will be accepted (i.e. not by email). The goals of the assignments are to help students synthesize information presented in class and in readings, to become familiar with basic but fundamental calculations in soil science, and interpret the results of real data. Graded assignments will be returned in class.

*Assignment 1 (10%): Soil Physical Properties and Moisture:* Students will be required to do some basic calculations to determine the proportion of different soil textures, moisture, bulk density, and porosity. As well, students will provide short answers describing why these are important to understanding soils at broader scales. Due on July 17<sup>th</sup>, at the beginning of class.

*Assignment 2 (25%): Soil Classification Report:* Using real soil morphology, chemistry, and environmental data collected from prior field studies at the UTM Erindale campus, and the taxonomic guide in the Canadian System of Soil Classification text, you will classify three mystery soils to the sub-group category. Due on July 31<sup>st</sup>, at the beginning of class.

**Tests:**

*Mid-term test (25%):* The midterm test will be given in class on Tuesday July 22<sup>nd</sup> and will cover all course material (lectures, readings) from July 3<sup>rd</sup> to July 17<sup>th</sup>. It will include multiple choice and short-answer questions that will be constructed from **both** lecture materials and assigned readings.

*Final exam (40%):* The final exam will take place during the scheduled exam period (August TBA) and will cover lecture and reading material from the entire term, although more emphasis will be placed on materials covered since the mid-term test. It will include multiple choice and short-answer questions that will be constructed from **both** lecture materials and assigned readings.

**LECTURES AND READINGS:** These are the textbook chapters associated with the lectures – please read them *before* class. Any other readings will be posted on Blackboard one week before class.

- July 3 (Thursday): Course details and introduction to soils (B&W Chapter 1)
- July 8 (Tuesday): Soil formation (Chapter 2), soil classification (B&W Chapter 3)
- July 10 (Thursday): Soil physical properties (B&W Chapter 4), soil and water (B&W Chapter 5)
- July 15 (Tuesday): *Assignment 1 due at the beginning of class.* Global hydrology (B&W Chapter 6) and soil organic matter and carbon cycling (B&W Chapter 11)
- July 17 (Thursday): Soil colloids and chemistry (B&W Chapter 8)
- July 22 (Tuesday): *Mid-Term Test.* Soil ecology (part 1 - B&W Chapter 10)
- July 24 (Thursday): Soil ecology (part 2 – Review B&W Chapter 10). Soil nutrients and cycling (part 1 – B&W Chapter 12)
- July 29 (Tuesday): Soil nutrients and cycling (part 2- Review B&W Chapter 12), soil acidification and pollution (B&W Chapter 9, 15)
- July 31 (Thursday): Plant-soil interactions (B&W Chapter 13, review Chapter 6), Canadian forest soils (CSSC Chapters 4, 8, 10)
- August 5 (Tuesday): *Assignment 2 due at the beginning of class.* Canadian prairie soils (CSSC Chapter 5), agricultural soil quality and soil erosion (Chapter 14; review Chapter 9 pg. 298-318 and Chapter 13)
- August 7 (Thursday): Canadian wetland and arctic soils, tropical soils (CSSC Chapters 6, 9)
- August 12 (Tuesday): Soils and climate change (review B&W Chapter 11). Final exam preparation

\*B&W = Brady and Weil. CSSC = Canadian System of Soil Classification 3<sup>rd</sup> ed.

### **COURSE POLICIES:**

**Missed tests or assignment deadlines:** Extensions on assignments will be granted only in the case of illness or other non-medical emergencies and must be supported with appropriate documentation. For a missed term test, contact me prior to the test if possible and no later than *2 days* after the original test date unless the nature of the emergency prohibits communication. For medical exemptions, only an official U of T form will be accepted (available online here:

<http://www.illnessverification.utoronto.ca/>). Please consult your college registrar if you are having difficulties during the term that prevent you from completing your course work. For non-medical emergencies, they may be able to provide a letter documenting your situation.

Failure to comply with this policy will result in a grade of zero for the assignment or midterm in question. Be aware that submitting a note which has been altered or obtained under false pretences is considered a very serious offence by the University. Deferred final exams are dealt with by the Registrar's office of your college. For students with a documented absence due to a medical condition or other serious event who are unable to submit an assignment within one week, the other assignments may be re-weighted accordingly.

**Assignment submission and late penalties:** Only print copies of assignments will be accepted and are due at the beginning of class (10 am) in the classroom (SS 2110). Anything handed in after the 10 am deadline that day will be considered one day late (including assignments handed in after class has begun). There will be a late penalty of 5% for each day late. Weekends count as two days. All late assignments should be handed in to the assignment drop box just outside the Main Office (Sid Smith 5047) of the Department of Geography. Late assignments are due before the Main Office closes at the end of the day you decide to submit it. The office is open Mon-Fri, 9am-5pm and closes at 5 pm sharp, so do not come at the last minute. **Once the Main Office is closed, assignments will not be accepted and you'll have to return the next day** (and it will be counted another day late).

No assignments will be accepted *more than one week after the due date* unless the student has obtained prior permission from the instructor in the case of documented illness or other extenuating circumstances.

**Communication and email:** You are encouraged to ask questions in class and during office hours. To avoid inadvertent loss through spam-filtering, all e-mails must be from a U of T account, include GGR205 in the subject heading, and your full name in the text. I will respond within 48 hrs. Questions that require extensive responses should be asked during office hours or in class, not via email.

**Academic integrity:** Academic dishonesty, including plagiarism, will not be accepted. I recommend you consult the 'How not to plagiarize' website at:

<http://www.writing.utoronto.ca/advice/using-sources/hownot-to-plagiarize>

Please review the "Rules and Regulations" section of the Arts and Science Calendar ([www.artsandscience.utoronto.ca/ofr/calendar/rules.htm](http://www.artsandscience.utoronto.ca/ofr/calendar/rules.htm)) for further information.

Discussion of assignments and working together to better understand materials are encouraged. However, your assignments are a unique reflection of your own efforts, and therefore should represent your own expression of these efforts. Assignments that are deemed to be too similar to others or using plagiarised materials may be rejected and submitted for consideration to the Dean's Office. Plagiarism can include directly quoting text from a source (e.g. textbook) without citation. Students should be paraphrasing rather than relying on quotes to demonstrate understanding of the materials. You are not expected to cite the textbooks, but you should not be quoting them either.

**Accessibility:** The University of Toronto is committed to accessibility. Students requiring accommodation are encouraged to discuss their needs with the instructor within the first two weeks of class, and should register with Accessibility Services in Robarts library, 1st floor; 215 Huron Street, 9th Floor, Room 939 (<http://www.accessibility.utoronto.ca/>)

**Accommodations for religious observances:** Please alert the instructor at least 2 weeks in advance if assignment due dates or examinations conflict with religious holidays, so alternate arrangements can be made.

**Class conduct:** Respectful behaviour towards instructors and your classmates is mandatory during class and in all correspondences dealing with the course. This includes arriving in class on time, not talking during lectures, and turning off cell phones. Students are also advised to refrain from using electronic devices for entertainment purposes, such as internet browsing. Students who repeatedly engage in these activities will be asked to leave the classroom. Aggressive behaviour will not be tolerated.