

Fall 2019

General Information

Course Code: ENVS 3220

Course Title: Terrestrial Chemistry

Course Description:

This course surveys the behaviour of elements in the Earth's surface environments, encompassing soils and saturated (wetland, lake, river) sediments. The course is focused on understanding the factors that control the chemical processes governing soils and freshwater sediments through the reactions of the elements and molecules that they contain. Students will extend their fundamental understanding of chemistry to the materials of the Earth's upper crust.

Credit Weight:

0.5

Academic Department (or campus):

School of Environmental Sciences

Campus:

Guelph

Semester Offering:

Fall 2019

Class Schedule and Location:

Lectures MW 1:30-2:30 MCKN 233

Seminar M 9:30-11:20 ALEX 309

Instructor Information

Instructor Name: Dr. Susan Glasauer

Instructor Email: glasauer@uoguelph.ca

Instructor Phone and Extension: (519) 824-4120 ext. 52453

Office location and office hours: Alexander 321; M 4:30-5:30

Course Content

Specific Learning Outcomes:

Students will be provided with opportunities to:

1. Understand how biotic and abiotic components of soils and sediments control element chemistry.
2. Select and apply appropriate analytical methods to characterize soil and sediment chemistry.
3. Critically evaluate information pertinent to soil and sediment chemistry presented in scientific, technical and popular formats.
4. Communicate ideas and information pertinent to soil and sediment chemistry and demonstrate accurate use of scientific terminology and notation.
5. Select and apply appropriate quantitative methods to solve problems pertinent to terrestrial chemistry.
6. Understand soil and sediment chemistry in the broader contexts of inorganic chemistry and geochemistry.
7. Apply information that is learned about soil and sediment chemical processes to develop treatment approaches for contaminated soil and sediment.

Lecture Content:

The course will follow the schedule of lectures, assignments and midterms shown on the following page.

Terrestrial Chemistry (ENVS3220)

F'19

Week	Date	Lect. #	Topic	Recommended Reading	Seminars (Mon) and Due Dates
1			No class meeting		
2	Sept 9	1	Scope; element occurrence, groups, valence and species	MESS 1-31	Units&conversions; MESS 32-37
	Sept 11	2			
3	Sept 16	3	Water: universal solvent	MESS 207-221	Equilib const; Ionic strength & activity
	Sept 18	4	Hydrolysis & ionic potential	MESS 221-225	
4	Sept 23	5	Acid-base geochemistry	MESS 226-229	Carbonates
	Sept 25	6	Carbonates and metals		
5	Sept 30	7	Building minerals	MESS 55-65 MESS 129-134; 136-140	ASSIGN1 DUE 9/30 Minerals & mineral ID
	Oct 2	8	Mineral weathering		
6	Oct 7	9	Fe, Mn and Al oxides	MESS 104-113 MESS 289-298	Clay minerals BOHN Ch4: 104-121
	Oct 9	10	Mineral dissolution & precipitation		
7	Oct 14 TG	11	MIDTERM I		
	Oct 16				
8	Oct 21	12	Organic carbon: non-humic and humic substances	MESS 155-165; 165-179; 179-181; 187-191	Solubility products
	Oct 23	13			
9	Oct 28	14	Surface charge density & pzc	MESS 393-402 MESS 402-408	ASSIGN 2 DUE 10/28 Surface reactions MESS 383-393
	Oct 30	15	Describing surface charge		
10	Nov 4	16	Adsorption	MESS 408-413	TBA
	Nov 6	17	Adsorption isotherms	MESS 413-438	
11	Nov 11	18	Reduction and oxidation rxns	MESS 349-354	Adsorp isotherms MESS 413-438
	Nov 13	19	Geochemistry of wet soils	MESS 359-366	
12	Nov 18	20	Soil acidity	MESS 489-497	ASSIGN 3 DUE 11/18 Metal bioremediation
	Nov 20	21	Acid soil	MESS 541-549	
13	Nov 25	22	Managing acidity	MESS 550-557	MIDTERM II 11/25 Nov. 29: Managing salt
	Nov 27	23	Salt affected soil	MESS 565-570	
	Nov 29	24	Review		

Students should be prepared to take notes in class by hand. I don't typically use Powerpoint for lectures, but I will post the notes that I take during class on Courselink after class. Electronic devices (laptops, tablets) may be used in class with instructor permission. You will probably find it easier to take notes by hand.

Labs:

Not applicable

Seminars:

Seminars take place on Monday and reinforce the topics of the course lectures. It's important to attend the seminars, where we use hands-on exercises to apply and extend the key concepts of the course.

Course Assignments and Tests:

Assignment or Test	Due Date	Contribution to Final Mark (%)	Learning Outcomes Assessed
ASSIGN 1	Sept. 30	10	1,3,4,5,6
ASSIGN 2	Oct. 28	10	1,3,4,5,6
ASSIGN 3	Nov. 18	10	1,2,3,4,5,6
Midterm I	Oct. 16	20	1,2,5
Midterm II	Nov. 25	20	1,3,4,5,6
Final	Dec. 13	30	1,2,3,4,5,6,7

Additional Notes (if required):

I will hand out the assignments no later than one week before they are due.

Final examination date and time:

Dec. 13, 7-9 pm.

Final exam weighting:

30%

The final exam is comprehensive.

Course Resources

Required Texts: none

Recommended Text:

Soil and Water Chemistry, an Integrative Approach, 2nd Edition. Michael E. Essington. CRC Press, 2015.

This textbook will be available on library reserve.

Other recommended reading will be posted on the course website (Courselink).

Other Resources:

Any additional reading will be posted on the Courselink site for the course.

Electronic materials from the lectures and seminars will be posted on Courselink after the lecture only.

Course Policies

Grading Policies:

Assignments will be collected on the due dates at the beginning of the class period, as shown in the course schedule.

Policy on Late Assignments: Making up a missed exam or assignment requires a doctor's note or equivalent. Late assignments will be penalized at a rate of 10% markdown per day after the due date.

Copies of out-of-class assignments: Keep paper and/or other reliable electronic back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Course Policy on Group Work:

Group work will be allowed only where explicitly assigned by the instructor.

Course Policy regarding use of electronic devices and recording of lectures:

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the written permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Phones and laptops are distractions not just for the people using them, but for others sharing the same space. A Canadian study showed that students attempting to multi-task using laptops in the classroom did much worse than peers using pencil and paper to take notes. Even worse, students sitting next to the multi-taskers also suffered significantly ("Students' use of laptops in class lowers grades: Canadian study". Globe and Mail, August 14, 2013).

The use of laptops, tablets and cell phones, including checking messages, is prohibited during class time. Please leave the room if you need to use your phone. Laptops are essential for some students to take notes, but they create a distracting space within the classroom when not used for notetaking. You must discuss your use of an electronic device for taking notes with me prior to using it in the classroom.

University Policies

Academic Consideration:

The University of Guelph is committed to supporting students in their learning experiences and responding to their individual needs and is aware that a variety of situations or events beyond the

student's control may affect academic performance. Support is provided to accommodate academic needs in the face of personal difficulties or unforeseen events in the form of Academic Consideration.

Information on regulations and procedures for Academic Consideration, Appeals and Petitions, including categories, grounds, timelines and appeals can be found in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Academic Misconduct:

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.

University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Detailed information regarding the Academic Misconduct policy is available in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Accessibility:

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services (SAS), formerly Centre for Students with Disabilities (CSD), as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email sas@uoguelph.ca or visit the [Student Accessibility Services website \(http://www.uoguelph.ca/csd/\)](http://www.uoguelph.ca/csd/).

Course Evaluation Information:

End of semester course and instructor evaluations provide students the opportunity to have their comments and opinions used as an important component in the Faculty Tenure and Promotion process, and as valuable feedback to help instructors enhance the quality of their teaching effectiveness and course delivery.

While many course evaluations are conducted in class others are now conducted online. Please refer to the [Course and Instructor Evaluation Website](#) for more information.

Drop period:

The drop period for single semester courses starts at the beginning of the add period and extends to the Fortieth (40th) class day of the current semester (the last date to drop a single semester courses without academic penalty) which is listed in [Section III \(Schedule of Dates\) of the Undergraduate Calendar](#).

The drop period for two semester courses starts at the beginning of the add period in the first semester and extends to the last day of the add period in the second semester.

Information about Dropping Courses can be found in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Additional Course Information

Commitment to the course:

This course is worth 0.5 credits. According to University policy, you should plan on spending up to 12 hours per week engaged with this course, including lectures and seminars. That provides around 8 hours to complete the reading and class assignments and to study the lecture material outside of class meetings. If you have invested this amount of time and still feel like you're struggling to keep up, please make an appointment to see me.