

**ENVS\*3220 Terrestrial Chemistry**

Fall 2018

Section(s): C01

School of Environmental Sciences Credit Weight: 0.50

Version 1.00 - September 04, 2018

# Course Details

## Calendar 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.

### Pre-Requisite(s):

* 1. **Timetable**

CHEM\*1050, ( 1 of ENVS\*1050, ENVS\*2060, ENVS\*2240)

Lectures: MW 12:30-13:20 ROZH 107

Seminar: F 15:30-17:20 ALEX 309

## Final Exam

Exam time: Friday December 14, 2018 7:00 - 9:00 pm. Location TBD

# Instructional Support

## Instructor(s)

### Susan Glasauer Email: Telephone: Office:

**Office Hours:**

[glasauer@uoguelph.ca](mailto:glasauer@uoguelph.ca)

+1-519-824-4120 x52453

ALEX 321

M 4:30-5:30

# Learning Resources

## Recommended Resource(s)

### Recommended Texts (Textbook)

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

This textbook is available on library reserve.

Other recommended reading will be posted on the D2L website for the course

## Additional Resource(s)

### Field Trips (Other)

The field trip will be to the Fletcher Creek Ecological Reserve, approximately 20 km south of Gueph, on September 29. Transportation will be by student vehicles or by rental van. If rental vans are used, students will be required to pay a small amount to cover the cost (estimated to be around $10/person).

# Learning Outcomes

## Course Learning Outcomes

By the end of this course, you should be able 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.

# Teaching and Learning Activities

## Lecture

### Topic(s):

Lectures

Students should be prepared to take notes in class by hand. Powerpoint is used on a limited basis only to reinforce select lecture material. Electronic devices (laptops, tablets) may be

used in class only with instructor permission.

### Week 1

**Topic(s):**

MESS 1-6;32-37

### Week 2

**Topic(s):**

Scope of Terrestrial Chem.

Week 2

Sept 11: Element occurrence, species, MESS 6-11 Sept 13: Terrestrial elements, MESS 11-31

### Week 3

**Topic(s):**

Week 3

Sept 18: Terrestrial elements, MESS 11-31

Sept 20: Minerals in sediments: 1°, 2°, Bohn 4; MESS 55-65

### Week 4

**Topic(s):**

Week 4

Sept 25: Clays minerals, Bohn4

Sept 27: Metal oxides, hydration, pzc

### Week 5

**Topic(s):**

Week 5

Oct 2: Weathering: mineral decay, MESS 129-133 Oct 4: Weathering; organic matter, MESS 155-165

### Week 6

**Topic(s):**

Week 6

Oct 11: Evolution of organic matter, MESS 177-187, MESS 226-229

### Week 7

**Topic(s):**

Week 7

Oct 16: Water: ideal solvent, MESS 207-221

Oct 18: Metal hydrolysis, ionic potential, MESS 221-225

### Week 8

**Topic(s):**

Week 8

Oct 23: Carbonic acid (L-B), MESS 226-232

Oct 25: Ion speciation, complexes, MESS 232-236; 256-259

### Week 9

**Topic(s):**

Week 9

Oct 30- Nov 1: Mineral dissolution & precipitation, MESS 289-298, MESS 303-311; 334-340

### Week 10

**Topic(s):**

Week 10

Nov 6:Life without oxygen, SCH 242-270 Nov 8: Redox reactions

### Week 11

**Topic(s):**

Week 11

Nov 13: Wetlands for remediation, MESS 372-379 Nov 15: Surface reactions, MESS 383-393

### Week 12

**Topic(s):**

Week 12

Nov 20: Surface charge density, MESS 394-402

Nov 22:Charge models: EDL, MESS 402-408; 408-429

### Topic(s):

Week 13

Nov 27: Acid soils, MESS 537; 541-557 Nov 29: Mine waste

## Seminar

### Week 1

**Topic(s):**

**Week 2**

**Topic(s):**

**Week 3**

**Topic(s):**

**Week 4**

**Topic(s):**

**Week 5**

**Topic(s):**

**Week 6**

**Topic(s):**

**Week 7**

**Topic(s):**

**Week 8**

**Topic(s):**

**Week 9**

**Topic(s):**

**Week 10 Topic(s):**

**Week 11 Topic(s):**

**Week 12 Topic(s):**

**Week 13 Topic(s):**

Intro, Unit exercise Back of the envelope

ASSIGN 1 Minerals, Bowen Field trip – Fletcher Creek Mineral ID

Organic acids, L-B ASSIGN 2 Ionic strength & activity MIDTERM

Assessing mineral reactions ASSIGN 3 Redox exercise Design a wetland

Adsorption models ASSIGN 4 TBA

# Assessments

## Marking Schemes & Distributions

|  |  |
| --- | --- |
| Name | Scheme A (%) |
| ASSIGN 1 | 8 |
| ASSIGN 2 | 8 |

|  |  |
| --- | --- |
| Name | Scheme A (%) |
| ASSIGN 3 | 8 |
| ASSIGN 4 | 8 |
| Field Trip | 0 |
| Midterm | 28 |
| Final Exam | 40 |
| Total | 100 |

* 1. **Assessment Details**

### ASSIGN 1 (8%)

**Due:** Sept 22

### ASSIGN 2 (8%)

**Due:** Oct 13

### ASSIGN 3 (8%)

**Due:** Nov 10

### ASSIGN 4 (8%)

**Due:** Dec 1

### Field Trip (0%)

**Date:** Sept 29

### Midterm (28%)

**Date:** Oct 27

### Final Exam (40%) Date: TBA

1. **Course Statements**
   1. **Grading Policies**

Assignments will be submitted during the seminar period as shown in the course schedule. The midterm will take place during the seminar period on Oct. 27.

## 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 20% 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.

## Group Work

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

# University Statements

## Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e- mail is the official route of communication between the University and its students.

## When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for [Academic Consideration](https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml) are detailed in the Undergraduate Calendar.

## Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two- semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml) are available in the Undergraduate Calendar.

## Copies of Out-of-class Assignments

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

## Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: [www.uoguelph.ca/sas](http://www.uoguelph.ca/sas)

## 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.

The [Academic Misconduct Policy](https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml) is detailed in the Undergraduate Calendar.

## Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the 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.

## Resources

The [Academic Calendars](https://www.uoguelph.ca/registrar/calendars/) are the source of information about the University of Guelph’s procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.