Winter 2018

Introduction to Environmental Geochemistry
- Earth Sc 2Q03/Envir Sc 2Q03

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Prerequisite(s): ISCI 1A24; or CHEM 1A03 and one of ENVIRSC 1C03, ENVIRSC 1G03 (ENVIRSC 1A03, ENVIRSC 1B03); or registration in Level II or above of a program in the Faculty of Engineering. ENVIRSC 1C03 is recommended.

Antirequisite(s): EARTHSC 2L03; ENVIRSC 2L03

Course Outline and Objectives:

The primary aim of this course is to introduce students to environmental geochemistry, which seeks to quantify the natural geochemical cycles of elements at the surface of the Earth, as well as the effects of human activities upon these cycles. Environmental geochemists focus on the characterization of the processes involved in the distribution, abundance and transport of chemical substances, as well as the identification of element sources and sinks (i.e. bedrock, soils, sediments and water) in the environment. Water rock interactions determine important characteristics of lakes, rivers, groundwater and oceans; hence the name “geo-chemistry”. However, the ultimate geochemical characteristics of any environment also reflect interactions with environmental microorganisms. This course is designed to introduce students to the fundamental chemical principles underlying the major types of reactions that occur in the environment, the biogeochemical nature of these processes, as well as the methods used for characterization, using applied exampled. The course balances the acquisition of a knowledge component with the development of personal transferable skills. In this course, students will enhance their numerical literacy, research, critical thinking and written communication skills by completion of laboratory reports. Time management and organization skills will be developed through the laboratory component of the course.

Course Structure:

- Two 1-hour lectures per week will be given on Wednesday (12:30 pm - 1:20 pm) and Friday (12:30 pm - 1:20 pm) in PC 155. All students are expected to attend all lectures. Only partial lecture notes will be available on Avenue-to-Learn. Therefore, it is the responsibility of the student to ensure that class notes are obtained for any classes they have missed.
• Laboratory sessions will be held on Monday or Tuesday in BSB-315. A series of laboratory tasks will be assigned, demonstrated, and carried out during the laboratory sessions. Please check your laboratory schedule on MOSAIC. **Attending the laboratory sessions is mandatory** (see the laboratory section below for details).

**Course Materials:**

• Environmental and Low temperature Geochemistry. 1st ed. by Peter Ryan, WILEY BLACKWELL

• Assigned laboratory materials will be posted throughout the term one week prior to laboratories (available on Avenue to Learn)

**Course Evaluation:**

- Laboratory Assignments 30%
- Two Midterm Exam (each 15%, TBA) 30%
- Final Exam (cumulative, during exam period) 40%

**Course Contract:**

All students are responsible to read and complete the course contract on Avenue to Learn (an additional copy is attached to this course outline, for reference). This contract is a component of the course outline, and extends as well as specifies a number of essential course policies that students must be aware of. Students will not be able to participate in labs, submit associated lab assignments for marks, and write the midterm or final exam unless they submit their contract to their T.A. **You must bring your completed contract to your first lab.**

**Grade appeal and A2L grade policy:**

You will have 7 calendar days from the date when your grade for a particular course evaluation component (e.g., Midterm Exam) is released to appeal your grade. If you wish to appeal a grade, you must submit a written note (including your name, McMaster email address, and student ID number) to your T.A. for laboratory grades or to your instructor for my midterm grade, stating the component that you wish to be investigated and justifying why you wish to have the evaluation reviewed. If the written request is found to be insufficiently justified (e.g., simply wanting a higher mark is insufficient), the appeal will not be investigated further.

Your grades will be recorded on A2L. It is your responsibility to check that all grades entered into A2L are recorded properly. You must notify your T.A. about any errors with regards to how your grade is entered. You have 48 hours prior to the final exam to discuss any A2L mark issues.
**Attendance and E-mail policy:**

If you missed a lecture, it is not the T.A.’s responsibility to go over the entire lecture with you. It is your responsibility to acquire the necessary information from your classmates and to keep up with news, announcements, updates, and other information posted on Avenue-to-Learn.

It is not appropriate to use e-mail to ask detailed questions (including asking about what was discussed in lecture). As a general rule, you should not expect to receive answers to e-mails on weekends or late in the evening. Rather, e-mails will typically be answered during regular working hours on weekdays and as time allows. E-mails sent on either the day of the Midterm/Final Exam or on the due date of an assignment will not be answered.

As a courtesy and to ensure that your e-mails are answered properly, you must include your name and student ID number in the e-mail signature. E-mails **must** be sent from McMaster email accounts or they will not be read or answered. E-mails should be written in a professional manner, spell-checked, and proof-read before sending them.

**Laboratories:**

All labs will be held in BSB-315 and attendance is mandatory. Attendance will be taken each laboratory period. You have been assigned to a lab section time by the registrar’s office. You will be assigned to one of two groups within your lab section by your TA and your group assignment will be posted on Avenue to Learn.

The first lab will occur the week of January 15th. During the first lab, each lab section will be divided into two groups (1 and 2). These groups will attend the following lab sections on alternating weeks as described by the schedule below. You must attend your lab section during the week assigned to your group. For labs 2 and 3, students will not be permitted to attend lab during the week assigned for the other group within their section. A complete lab schedule is attached.

**PLEASE NOTE:** Students who are more than 5 minutes late for lab will not be permitted to do the lab, and will not be authorized to submit a report for the missed lab. *They will get a mark of zero as a result.*

**ATTIRE:** Students must wear a lab coat, safety glasses, long pants and closed toed shoes (NO CONTACT LENSES, STUDENTS MUST WEAR GLASSES) for labs 2 and 3. *Students who do not have the proper attire will not be permitted to complete the lab and will get a mark of zero.*

Laboratory protocols will be posted on A2L and students are required to read this material. For labs 2 and 3, brief pre-lab quizzes (not for marks) will be available prior to each lab, to evaluate your knowledge of what the lab entails. *You will not be allowed to participate to a lab unless you obtain a perfect mark (100%) on the corresponding pre-lab quiz.*

**Laboratory Reports:**

The Lab reports will be due no later than 4:30 p.m. on the specified due date, and should be submitted in the EARTH/ENVIR SC 2Q03 drop box on the 2nd floor of GSB.
This first page of your lab reports/assignments will need to include ALL of the following information: name, student ID number, course name and number (i.e. EARTH SC 2Q03), assignment number (e.g. Lab 2), name of your teaching assistant (T.A), lab section number or day/time or your lab section, group number and due date. **Assignments submitted without this information will be penalized, i.e. 10% of the lab mark obtained will be deducted.**

This may also result in your mark not being entered on A2L, particularly if the student’s information is completely missing. **In these circumstances, the Instructor or T.A. will make NO attempt at identifying who is the author of the report.**

The second floor of GSB locks around 4:30 pm but you can still submit your lab reports to the after-hours drop box located at the western end of GSB. These reports will be collected the following day and date stamped with that date, not the date you physically put the report in the after-hours drop box.

**Late work and penalty:** Reports submitted late will be penalized, i.e. **25%** of the mark obtained will be subtracted for each day of lateness; weekends count as one day.

**Missed work:**

If you miss the deadline for a deliverable, for a legitimate reason, you must follow the following two steps:

1) You can report absences that last up to 3 days using the McMaster Student Absence Form (MSAF). Please see the section titled ‘McMaster Student Absence Form (MSAF)’ for further information. Do not bring a doctor’s note to your instructor or T.A

2) You **must** contact your instructor to find out what accommodations, if any, will be made for the missed assignment. Most likely, you will be given a short extension.

If you do not complete these two steps within **7 days** of the missed evaluation, you will receive a mark of zero.

**Unless specified otherwise, no penalties will be applied to material submitted late with justification. LAB REPORTS SUBMITTED LATE WITHOUT JUSTIFICATION WILL BE GIVEN A PENALTY OF 25% PER DAY OF LATENESS.** All late assignments must be handed into the drop boxes on the second floor of GSB.

**NO accommodation will be made for extra-curricular activities (participation to varsity teams, academic clubs, etc.) without students having documentation approved by their Associate Dean’s office in advance.** Accommodations, approved by the Associate Dean’s office, will need to be discussed **a minimum of two weeks** before a course component will be missed or due.

**McMaster Student Absence Form (MSAF):**

If you are absent from the university for medical or personal reasons, lasting fewer than 3 days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form. Absences for a longer duration or for other reasons must be reported to your Faculty/Program office, with documentation, and
relief from term work may not necessarily be granted. When using the MSAF, report your absence to the course instructors via email. You must contact your instructor immediately (normally within 7 working days) by email to learn what relief if any, may be granted for the work you have missed, and relevant details such as revised deadlines, or time and location of a make-up evaluation. Please note that the MSAF may not be used for term work worth 25% or more, nor can it be used for the final examination.

Please note: students who use the MSAF, but who do not contact the instructor within the 7 working days period, may not be granted any relief.

Students who miss more than two lab periods without submitting an MSAF for the first missed laboratory and documentation for the second missed laboratory, approved by their Associate Dean’s office will automatically fail the course. Students who fail to submit MORE THAN ONE laboratory assignments without, either submitting the MSAF or documentation approved by their Associate Dean’s office will automatically fail the course.

Late Work:

Late labs will be assigned a penalty of 25% per day of the assignment final grade. All late labs must be handed into the drop box on the second floor of the General Science Building (GSB). There is no access to the drop-boxes after 4:30 p.m. or on weekends, but there is an after-hours drop box on the second floor of GSB just inside the door on the west side stairs. Note that weekends count as one day.

Avenue to Learn (A2L): http://avenue.mcmaster.ca

A2L is an online system, which will be used in this class for communicating information relating to the course (e.g. lecture notes, lab preparation etc.). To log in to A2L, use your MOSAIC login and password. See the A2L home page above for more instructions if you need them. It is the student’s responsibility to check A2L regularly (i.e. AT LEAST twice a week) for updates.

Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

If you encounter any technical problems with this service go to the following website for support:
http://avenue.mcmaster.ca/help/

Please note that it is not the responsibility of the teaching staff of EARTH/ENVIR SC 2Q03 to assist you with A2L issues.

Student Conduct:

Students’ behaviour in all aspects of this course should meet the standards of the McMaster University Student Code of Conduct. Any inappropriate behaviour directed against any of your colleagues, T.A, or the instructor will not be tolerated. Disruptive behaviour during lectures will also not be tolerated.

This also means that the A2L Discussion Board is an extension of the classroom. These spaces are to be considered inclusive and safe. Abuse, ridicule, slander, inappropriate language, and discrimination towards the
instructor, teaching staff, and other students will not be tolerated in any capacity. This may lead to various disciplinary measures including, but not limited to, removal of access privileges to the A2L for EARTH/ENVIR SC 2Q03.

**Academic Integrity:**

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at [http://www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity)

The following illustrates only three forms of academic dishonesty:

- Plagiarism (e.g., the submission of work that is not one’s own or for which other credit has been obtained).
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

**Acknowledgement of Course Policies:**

Your registration and continuous participation (e.g. on A2L, in the classroom, etc.) to the various learning activities of EARTH/ENVIR SC 2Q03 will be considered to be an implicit acknowledgement of the course policies outlined above, or of any other that may be announced during lecture and/or on A2L. **It is your responsibility to read this course outline, to familiarize yourself with the course policies and to act accordingly.** Lack of awareness of the course policies **cannot be invoked** at any point during this course for failure to meet them. It is your responsibility to ask for clarification on any policies that you do not understand. The instructor reserves the right to modify elements of the course and will notify students accordingly (in class and post any changes to the course A2L). The lecture and laboratory schedules are only a guideline and may be modified during the course of the class.

*The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.*
**Lecture Schedule:** The proposed schedule may change during the term. Any changes will be announced in class.

<table>
<thead>
<tr>
<th>Week beginning</th>
<th>Lecture Topics</th>
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<tbody>
<tr>
<td>Jan. 1</td>
<td>Introduction/Overview</td>
</tr>
<tr>
<td>Jan. 8</td>
<td>Quantifying chemicals, Mineral species and balanced reactions</td>
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<tr>
<td>Jan. 15</td>
<td>Equilibrium and Redox</td>
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<tr>
<td>Jan. 22</td>
<td>Reactions and Rates</td>
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<td>Jan. 29</td>
<td><strong>Midterm #1,</strong> Aqueous systems (speciation, ion activities, ionic strength)</td>
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<tr>
<td>Feb. 5</td>
<td>Aqueous systems (solubility product, saturation)</td>
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<tr>
<td>Feb. 12</td>
<td>Carbonate Geochemistry (speciation, pH, alkalinity)</td>
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<td>Feb. 19</td>
<td><strong>Mid-Term Recess</strong></td>
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<tr>
<td>Feb. 26</td>
<td>Carbonate Geochemistry (solubility, stability, examples), Carbon cycle</td>
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<tr>
<td>Mar. 5</td>
<td><strong>Midterm #2,</strong> Biogeochemical cycles</td>
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<tr>
<td>Mar. 12</td>
<td>Biogeochemical cycles</td>
</tr>
<tr>
<td>Mar. 19</td>
<td>Stable Isotopes</td>
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<tr>
<td>Mar. 26</td>
<td>Radiogenic Isotopes, <strong>Good Friday (March 30)</strong></td>
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<tr>
<td>Apr. 2</td>
<td>Radiogenic Isotopes, Review</td>
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**Laboratory Schedule:** The proposed schedule may change during the term. Any changes will be announced in class.

<table>
<thead>
<tr>
<th>Labs</th>
<th>Dates</th>
<th>Location</th>
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<tbody>
<tr>
<td>Lab. 1</td>
<td>Week of Jan. 15th</td>
<td>BSB-315</td>
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<td></td>
<td>Note: During Lab 1, you will be divided into two groups. Attendance for Labs 2 and 3 will be on alternating weeks for these two groups. (i.e., Group 1 will come the first week listed and Group 2 the second week.)</td>
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<tr>
<td>Lab. 2A</td>
<td>Weeks of Jan 22nd and 29th</td>
<td>BSB-315</td>
</tr>
</tbody>
</table>
The Lab reports will be due no later than 4:30 p.m. on the specified due date, and should be submitted in the EARTH/ENVIR SC 2Q03 drop box on the 2nd floor of GSB.