GEOG 505 Global Biogeochemistry 2019

Instructors: Tim Moore, BH626, 398-4961, tim.moore@mcgill.ca
Class time: Tuesday 11:35 – 14:25, Room 426 Burnside Hall
Office hours: by appointment

Outline and Format

This course will focus on biogeochemistry, with an emphasis on biogeochemical cycling at two different scales: plot to catchment, and the globe. We shall examine the storage and pathways of major elements and chemical species, their role in controlling catchment and global systems and the effect of human activity on these cycles. At the global scale, we will focus on carbon; at the catchment to plot scale, we will focus on nitrogen.

The course comprises three lectures leading into six student-led discussions reviewing recent journal articles, such as those in *Global Biogeochemical Cycles*, *JGR-Biogeosciences*, *Ecosystems*, *Nature* and *Science*. Students will be responsible for critically summarizing 2 to 3 papers over the duration of the course. Each student will lead a 10 to 15 minute discussion of the papers they are assigned. This entails an introduction to the paper and its context, the scientific questions asked, the important findings and conclusions and the points of debate (e.g., contradictions with other results etc.). Students are expected to read all the papers reviewed each week and contribute to the discussion.

There will be a group project (~4 students/group) where the groups will attempt to resolve an elemental or chemical species cycle at the global scale, drawing upon the primary literature, and presenting their findings to the class. Each member of a group will produce a written report describing their subcomponent of the global cycle and contribute to a collective executive summary where an attempt is made to resolve the global budget. The individual subsections and executive summary should be collated and submitted as a single group report. The subsections should be short and concise (maximum length of 6 pages, typed, double spaced, excluding tables and diagrams). The executive summary should be a maximum of length of 5 pages (typed, double spaced, including tables and diagrams). The executive summary should also include a statement on the sources of uncertainty and where biogeochemists should invest their efforts to improve the budget. In class on February 26 we will take time to review the progress of the group budgets so you should aim to have your first approximation of the values of the stores and fluxes of your component of your group’s budget ready for that class. On March 12, each group will have 40 minutes to present their major findings (5 minutes for each subsection, 5 minutes for the presentation of the summary, and 10 minutes for questions). The written submission is due March 19, 2019.

Finally, each student is required to write a major paper (maximum length of 15 pages, typed, double spaced, excluding diagrams and tables) on an aspect of biogeochemistry that is of personal interest. The topic for the paper needs to be approved by an instructor. The paper should be an in-depth, critical synthesis of the primary literature of the subject area. On April 08, each student will present a poster on the subject of their major paper. The paper is due by 16:00, April 16, 2019.

The course is open to graduate and advanced undergraduate (with permission) students.
Readings
Three books are of value for an overview of the material presented in the course:
The main readings will be a series of papers, accessible through *MyCourses*.

Grading
Class participation 30% (paper summaries [20%] and quality and contributions to the discussions [10%])
Group project 40% (written subsection, executive summary and seminar presentation)
Term paper 30% (paper and presentation)

Schedule and Topics
Jan. 08 Wk 1 Overview and introduction to global biogeochemical cycles
Jan. 15 Wk 2 Foundational papers
Jan. 22 Wk 3 Allocation of papers to students for presentation and advice on library research by Jennifer Zhao, Schulich Science and Engineering Librarian
Jan. 29 Wk 4 Global carbon cycle lecture; assemble budget groups
Feb. 05 Wk 5 Carbon cycling: feedbacks in the global carbon cycle (student discussions)
Feb. 12 Wk 6 Soil carbon: (student discussions) work on budget projects
Feb. 19 Wk 7 Dissolved organic carbon (student discussions)
Feb. 26 Wk 8 Ecosystem-catchment nitrogen cycle lecture; review budget group progress
Mar. 05 Reading week
Mar. 12 Wk 9 Group biogeochemical ‘budget’ presentations
Mar. 19 Wk 10 Nitrogen cycling 1 (student discussions), submit group reports
Mar. 26 Wk 11 Nitrogen cycling 2 (student discussions)
Apr. 02 Wk 12 N cycling 3 (student discussions)
Apr. 09 Wk 13 Student symposium: presentation of term papers as posters (including lunch….)
McGill Statements

Language of Submission

In accord with McGill University’s Charter of Students’ Rights, students in this course have the right to submit in English or in French any written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives. (Approved by Senate on 21 January 2009 - see also the section in this document on Assignments and Evaluation.)

Conformément à la Charte des droits de l’étudiant de l’Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l’un des objets est la maîtrise d’une langue)

Academic Integrity

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information). (Approved by Senate on 29 January 2003)

L’université McGill attache une haute importance à l’honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par triche, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).

Course Communications

On January 1, 2004, McGill University instituted a policy that e-mail will be the official channel of communication (see http://www.mcgill.ca/email-policy/). Each student is assigned a unique e-mail address on registration and the instructors will use this address to periodically communicate important information to students. If you do not use the McGill e-mail either arrange to have your messages forwarded to the address you use or inform the instructors of an alternative e-mail address.

In GEOG 505, the instructors use the McGill University MyCourses system. You will find the course outline and the reading list on the GEOG 505 course page. With the assistance of the Schulich Library of Science and Engineering staff, the reading list will contain ‘hot links’ to the journal papers we review in this course. The instructors will also post announcements on the course home page so it is important that you regularly check the home page.

Course Evaluations

Course evaluations at McGill University are now done on-line through the Mercury system. Completing the evaluation is voluntary but the results of the evaluation are extremely useful to the instructors and can provide guidance for student who may wish to take this course in the future. We encourage you to participate in the evaluation of this course. The instructor will notify you when the evaluation period opens and will remind you periodically during the evaluation period of the value of completing the evaluations. Thank you.