

# New Course

Proposal Reference Number : 7698  
PRN Alias : 13-14#1111  
Version No : 3  
Submitted By : Ms Kristy Thornton  
Edited By : Ms Kristy Thornton

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## New Data

Program Affected? N

Program Change Form Submitted?

Subject/Course/Term EPSC 513

one term

Credit Weight or CEU's 3 credits

### Course Activities

Schedule Type	Hours per week
A - Lecture	3

Total Hours per Week : 3  
Total Number of Weeks : 13

### Course Title

Official Course Title :	Climate and the Carbon Cycle
Course Title in Calendar :	Climate and the Carbon Cycle

### Rationale

Unlike courses such as GEOG 321 Climatic Environments and ATOC 531 Dynamics of Current Climates, EPSC513 focuses on the links between the global carbon cycle and the geological evidence for large-scale changes in climate over the last 65 million years. The course closest in topic is ENVR 200, which is aimed primarily at U1-level B.A. and B.Sc. students in the domains, Minor and Diploma programs from the McGill School of Environment. EPSC 513 gives senior undergraduate students and graduate-level students an opportunity to explore this subject in depth through peer-reviewed scientific papers and with simple quantitative models.

### Responsible Instructor

### Course Description

What does the rapid increase in CO<sub>2</sub>, currently driven by human activities, mean for future climate? Where will the carbon released by humans go, and how long will it take? An overview of the mechanisms governing global climate, the carbon cycle, and geological evidence for past changes in climate and the carbon cycle. Through assignments, students build their own simple Earth System models in order to explore basic principles of the coupling between climate and the carbon cycle. Output from

Teaching Dept.	0289 : Earth & Planetary Sciences
Administering Faculty/Unit	SC : Faculty of Science
Prerequisites	Any one of ESYS 300, EPSC 340, ENVR 301, ATOC 315, or permission of instructor. Web Registration Blocked? : N
Corequisites	
Restrictions	
Supplementary Calendar Info	
Additional Course Charges	
Campus	Downtown
Projected Enrollment	25
Requires Resources Not Currently Available	N
Explanation for Required Resources	
Required Text/Resources Sent To Library?	
Library Consulted About Availability of Resources?	
Consultation Reports Attached?	
Effective Term of Implementation	201409
File Attachments	EPSC513-2013 Syllabus-updated.pdf <a href="#">View</a>
To be completed by the Faculty	
For Continuing Studies Use	

## Approvals Summary

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Version No.	Departmental Curriculum Committee	Departmental Meeting	Departmental Chair	Other Faculty	Curric/Academic Committee	Faculty	SCTP	Version Status



McGill University - Earth and Planetary Sciences

EPSC-513

## Climate and the Carbon Cycle

Professor: Eric Galbraith, [eric.galbraith@mcgill.ca](mailto:eric.galbraith@mcgill.ca), FDA 332. Office visits by appointment (please schedule by email).

### Course Description:

The rapid increase of atmospheric CO<sub>2</sub>, currently being driven by human activity, is changing the Earth's climate on a geological scale. This course delves into the fundamental mechanisms governing both global climate and the carbon cycle, and relates these to the natural climate variability over the past 65 million years. These natural climate changes provide an invaluable set of case studies with which to ground-truth our understanding of the mechanisms governing climate, and range from the warmth of the Paleocene, when forests of ferns thrived throughout the polar regions, to the recent ice age cycles, throughout which the global mass of glacial ice regularly varied by a factor of three. Assignments, to be completed in Matlab or python, will take students through the process of building their own simple Earth system models in order to explore basic principles of the coupling between climate and the carbon cycle. Recent papers in the literature will also be discussed.

Pre-requisites: Any one of ESYS 300 / EPSC 340 / ENVR 301 / ATOC 315.

### Course Mechanics:

The course will include two weekly lectures/seminars of 1.5 hr. Most will be lectures or discussion, and a few will be dedicated to student presentations. There is no assigned textbook. Useful figures will be posted on myCourses but students are responsible for taking their own notes. Supplementary readings will be posted on myCourses. Students are expected to download and read these in preparation for the relevant lectures or discussions, as specified.

### Expected Learning Outcomes:

- A thorough understanding of the mechanisms controlling global climate
- A general understanding of approaches to modeling climate
- An understanding of important types of proxy records
- Familiarity with the climate history of the Cenozoic
- A geological perspective on anthropogenic climate change

### Evaluation:

*30% Assignments.* Approximately eight assignments will be handed out throughout the semester, related to the lecture and reading material. Each one will be due within 6 days, by noon (e.g., handed out on Tuesday, due by noon on Monday).

*15% Research paper presentation.* Each student will be responsible for presenting one article for peer-reviewed scientific literature, selected from a list that relates to the

material covered in class. Presentations should include background information including prior work and rationale for the study, a summary of findings, and your critical analysis. Presentations will be graded based on the presenter's understanding of the article presented, style and effectiveness of communication.

*20% Midterm exam. 35% Final exam.* The midterm exam, scheduled during a regular class time, will cover the course material seen up to the date of the midterm exam. The final exam will be cumulative, i.e. cover material from the entire course. Students are responsible for the content of assigned readings (including the peer-reviewed papers presented by students) as well as the lectures. The exams may include short answer and essay questions.

### Schedule:

The course will broadly follow the plan outlined below. Weeks with assignments are indicated by \* (this may be subject to adjustments as the term progresses).

Week	Topic
1	Overview of climate, the Cenozoic era, and Earth's energy balance
2	Building a simple model of global climate*

Presentations:

Malek Yalaoui

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From: Josie D'Amico  
Sent: Wednesday, November 27, 2013 9:33 AM  
To: Malek Yalaoui  
Subject: FW: Consultation on proposed course conflict

Malek,

Here's a consultation from Geography. I have one from AOS which I'll send you in a separate e-mail.

Thanks.

Josie

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From: Eric Galbraith  
Sent: Tuesday, November 26, 2013 6:25 PM  
To: Josie D'Amico  
Cc: Jeanne Paquette, Dr.; Anthony Williams-Jones, Dr.  
Subject: Fwd: Consultation on proposed course conflict

Hi Josie -

Willy informed me that I should forward to you the email consultations regarding EPSC 513, which you discussed in the Academic Committee meeting. Please find the first response from Tim Moore, below, and the other from John Gyakum to follow.

Thanks,  
Eric

Begin forwarded message:

From: "Tim Moore, Prof." <[tim.moore@mcgill.ca](mailto:tim.moore@mcgill.ca)>  
Subject: RE: Consultation on proposed course conflict  
Date: November 25, 2013 at 3:55:59 PM EST  
To: Eric Galbraith <[eric.galbraith@mcgill.ca](mailto:eric.galbraith@mcgill.ca)>, "John R. Gyakum, Prof." <[john.gyakum@mcgill.ca](mailto:john.gyakum@mcgill.ca)>, "Nigel Roulet, Prof." <[nigel.roulet@mcgill.ca](mailto:nigel.roulet@mcgill.ca)>, "Navin Ramankutty, Prof." <[navin.ramankutty@mcgill.ca](mailto:navin.ramankutty@mcgill.ca)>  
Cc: Kristy Thornton <[kristy.thornton@mcgill.ca](mailto:kristy.thornton@mcgill.ca)>, "Jeanne Paquette, Dr." <[jeanne.paquette@mcgill.ca](mailto:jeanne.paquette@mcgill.ca)>, "Daniel Kirshbaum, Prof." <[daniel.kirshbaum@mcgill.ca](mailto:daniel.kirshbaum@mcgill.ca)>, "Michel F. Lapointe, Prof." <[michel.lapointe@mcgill.ca](mailto:michel.lapointe@mcgill.ca)>

Eric,

In haste, I have no personal objections. Nigel and I are teaching 'Global Biogeochemistry' GEOG505, which is divided into C and N sections, examining a series of papers in Nature/Science etc. and with a group project to define the

global budget, warts and all, for particular biogeochemical species. Items that your course will be complementary to this, in temporal scope, and involving the creation of a model.

tim

-----Original Message-----

From: Eric Galbraith

Sent: Monday, November 25, 2013 1:45 PM

To: John R. Gyakum, Prof.; Tim Moore, Prof.

Cc: Kristy Thornton; Jeanne Paquette, Dr.; David Kirshbaum, Prof.; Michael F. Lapointe, Prof.

Subject: Consultation on proposed course conflict

Hi Tim and John -

We have just been informed by Josie D'Amico that I should consult you both regarding a new course I have proposed, EPSC 513.

The details of the proposed course are given in the attached sample syllabus. It's pretty interdisciplinary, and really sits at the intersection of our three departments. I would hope that it would be potentially useful for upper level undergrads and grad students of your departments.

If you judge that there is more than 20% overlap with any ATOC or GEG courses, apparently we should impose restrictions, though I would actually be happy to alter the syllabus to avoid redundancy, if you do see any important conflicts. This is my first time proposing a course, so am just learning how the procedure works!

The Academic Council is meeting tomorrow, so I would appreciate your response today - please let me know if this is not feasible. I would be happy to discuss by phone if that would be most expedient, and can be reached at 514-654-5856.

Thanks very much!

All the best,  
Eric



Malek Yalaoui

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From: Josie D'Amico  
Sent: Wednesday, November 27, 2013 9:34 AM  
To: Malek Yalaoui  
Subject: FW: Consultation on proposed course conflict  
Attachments: ATOC-530\_Paleo\_Climates.doc

Malek,

Below is a consultation report from the Chair of AOS.

I'll write to Eric Galbraith about ATOC 530/Bruno Tremblay.

Thanks.

Josie

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From: Eric Galbraith  
Sent: Tuesday, November 26, 2013 6:26 PM  
To: Josie D'Amico  
Cc: Jeanne Paquette, Dr.; Anthony Williams-Jones, Dr.  
Subject: Fwd: Consultation on proposed course conflict

Begin forwarded message:

From: John Gyakum <[john.gyakum@mcgill.ca](mailto:john.gyakum@mcgill.ca)>  
Subject: Re: Consultation on proposed course conflict  
Date: November 25, 2013 at 9:03:25 PM EST  
To: Eric Galbraith <[eric.galbraith@mcgill.ca](mailto:eric.galbraith@mcgill.ca)>, <[tim.moore@mcgill.ca](mailto:tim.moore@mcgill.ca)>  
Cc: Kristy Thornton <[kristy.thornton@mcgill.ca](mailto:kristy.thornton@mcgill.ca)>, Jeanne Paquette <[jeanne.paquette@mcgill.ca](mailto:jeanne.paquette@mcgill.ca)>, <[daniel.kirshbaum@mcgill.ca](mailto:daniel.kirshbaum@mcgill.ca)>, "Michel F. Lapointe, Prof." <[michel.lapointe@mcgill.ca](mailto:michel.lapointe@mcgill.ca)>, John Gyakum <[john.gyakum@mcgill.ca](mailto:john.gyakum@mcgill.ca)>, Bruno Tremblay <[bruno.tremblay@mcgill.ca](mailto:bruno.tremblay@mcgill.ca)>

Good evening, Eric:

I have checked on our ATOC-530 course, Climate Dynamics, Paleoclimates, which both Lawrence Mysak, and Bruno, have been teaching.

The course outline on Bruno's course is attached. Perhaps Bruno has changed his material some since this outline was produced.

There is some overlap, but I think that you and Bruno (copied in this message) can work together to reduce perceived common material to less than 30%.

We can talk more about this tomorrow morning.

Sorry for the late reply. I had a seminar to attend this afternoon, and met with the speaker, Alan Betts, afterwards.

Your course proposal looks like a really great initiative!

Cheers,

John

On 11/25/13 1:45 PM, "Eric Galbraith" [eric.galbraith@mcgill.ca](mailto:eric.galbraith@mcgill.ca) wrote:

Hi Tim and John -

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