

**GEOGRAPHY AND ENVIRONMENTAL STUDIES**  
**Carleton University**

**COURSE OUTLINE - Winter 2020**

**COURSE:** **Climate and Atmospheric Change - GEOG 3105A**

**INSTRUCTOR:** **Derek Mueller**  
Room A427, Loeb Building  
Email: [derek.mueller@carleton.ca](mailto:derek.mueller@carleton.ca)  
Phone: 613-520-2600 x1984

**OFFICE HOURS:** Wednesdays 10:30-11:30, by chance or appointment

**TEACHING ASSISTANT:** Nicolas Pelletier ([nicolas.pelletier@carleton.ca](mailto:nicolas.pelletier@carleton.ca))

**PREREQUISITES:** GEOG 2013

**LECTURES:** Wednesdays 08:35 - 10:25 University Centre 378

**LABORATORY:** A2 Wednesdays 11:35 - 13:25 Loeb A237/A211  
A1 Thursday 08:35 - 10:25 Loeb A237/A211

**COURSE DESCRIPTION:**

The global climate system, with emphasis on global change variability over the historical and modern periods; the changing composition of the atmosphere and its impact on climate; analysis and interpretation of climatic and atmospheric data; modeling of climate systems (*from Carleton University, Undergraduate Calendar*).

Although the Earth's climate has varied appreciably in the past due to natural forcing, human activities are increasingly contributing to climate warming. Since the Earth's climate system is interlinked with many biophysical processes on the planet, climate change has important repercussions. This course will examine climate and atmospheric change from a scientific perspective. We will look at proxy evidence of past climate change followed by historical and instrumental records, which reveal recent and current climate variability, and then models, which enable the projection of future climates under certain scenarios. Students will gain an understanding of the relative importance of climate forcing factors and feedbacks as well as an appreciation of the uncertainties and outstanding debates in climate science. The focus of this course is how and why our climate changes from an interdisciplinary scientific perspective. However, we will take some time to examine some implications and impacts of climate change as well as the interface between science, the media, the public and policy.

**COURSE OBJECTIVES:**

The aim of this course is to give students a solid grounding in the science of climate change. By the end of the course, students will be able to separate scientific facts from personal opinions and will be prepared to participate in solving one of the most pervasive environmental issues and great challenge of our time. Another very important aspect of this course will be improving academic/scientific written communication. Students will improve their writing skills and learn to express the scientific knowledge they gain in a rigorous way.

## COMMUNICATION:

This course uses cuLearn, Carleton's learning management system. To access your courses on cuLearn go to <http://carleton.ca/culearn>. For help and support, go to <http://carleton.ca/students>. Any unresolved questions can be directed to Computing and Communication Services (CCS) by phone at 613-520-3700 or via email at [ccs.service.desk@carleton.ca](mailto:ccs.service.desk@carleton.ca)

**Private correspondence with the Instructor and Teaching Assistants should be through a Carleton email account (this is accessible in cuLearn).** If you have questions of a general nature, please post it to the discussion board in cuLearn so that others can benefit from the answers. The Instructor will check email and cuLearn every 24 hours and do their best to respond to queries within 48 hours.

Information on cuLearn or sent via email will be considered to have been provided to all students within 24 hours of posting and students will be fully responsible for reading and responding appropriately to this information.

## COURSE STRUCTURE:

A one term course with lectures, labs, assignments, term paper and a test.

## TEXTBOOK/READINGS:

### Required reading:

IPCC, 2013: *Summary for Policymakers*. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom. (available online for free [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_SPM\\_FINAL.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_SPM_FINAL.pdf))

### Recommended reading:

Dessler, A.E. 2016: *Introduction to Modern Climate Change*. Cambridge University Press, Cambridge, United Kingdom. ISBN 978-0-107-48067-4. A first edition of this book is acceptable as well. [On reserve at the library, on order at Haven Books]

White, R. 2010. *Climate Change in Canada*. Oxford University Press, Oxford, United Kingdom. ISBN-13: 9780195430608. [On reserve at the library]

### Recommended supplemental reading:

Intergovernmental Panel on Climate Change (IPCC). 2013. *Climate Change 2013: The physical science basis*. Cambridge University Press, Cambridge, United Kingdom. (available online for free [https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5\\_all\\_final.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf)) Lots of pages (>1500) but the **Technical Summary** is an excellent starting point. [Hard copy on reserve at the library]

Other materials (articles, etc.) that may be highlighted during the lectures will be available through cuLearn/ARES.

## ASSIGNMENTS/EXERCISES:

There will be 5 assignments/exercises to be submitted during the term:

- 1) You will be asked to read several articles and synthesize this material into a coherent text, you will select your own term paper topic (from a list of suggested topics) and search for relevant literature. (This will follow a session where you will learn how to search for literature).
- 2) You will explore recent climate change and interpret your findings using spreadsheet software and resources on the internet.
- 3) You will work on making a detailed outline of your term paper. As well you will begin writing a section of your paper and you will edit a peer's writing.
- 4) You will use a global climate model to run a climate scenario and interpret your findings.

5) You will read several papers and come ready to discuss these in a seminar and write a brief report.

Assignments must be typed and handed-in on cuLearn. Assignments that are late will be accepted with a penalty. For each day that assignments are late (rounding up to the nearest day), penalty marks will be deducted from your *final course grade*. Assignments later than 4 days will not be accepted. For assignments 1-4 the nominal penalty is 0.5 marks per day. No lates will be accepted for assignment 5.

**TERM PAPER:**

Students will write a research paper on a topic related to the course material. Students are expected to research the topic thoroughly and follow standard guidelines for academic paper writing, including proper referencing. Detailed instructions will be provided at a later date. Final papers will be due on cuLearn by **23:55 on March 29**. They should be no more than 2500 words of text (excluding figures, tables, references, etc.). Term papers that are late will be accepted with a penalty. For each day that assignments are late (rounding up to the nearest day), 2 marks will be deducted from your *final course grade*. Term papers later than 6 days will not be accepted.

Students who miss course deadlines for a valid medical reason or other extenuating circumstances must notify the instructor as soon as possible.

**EXAMINATION:**

There will be a final test held during class at the end of term. It will be based on the entire term.

<b>EVALUATION:</b>	Assignments/exercises (x5)	50%
	In-lecture participation	10%
	Term paper	30%
	In-class final test	<u>10%</u>
		100%

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

**Academic Accommodation:**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the [Student Guide](#)

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the [Student Guide](#)

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request

accommodations for the formally-scheduled exam (if applicable).

**Student Conduct:**

The University has adopted a policy to deal with allegations of academic misconduct. This policy is expressed in the document Carleton University Academic Integrity Policy, effective July 1, 2006. The policy describes in detail its scope of application, principles, definitions, rights and responsibilities, academic integrity standards, procedures, sanctions, transcript notations, appeal process, and records implications.

The complete policy is available at: <http://www2.carleton.ca/studentaffairs/student-rights-and-responsibilities/>

**Plagiarism:**

Plagiarism is presenting, whether intentional or not, the ideas, expression of ideas or work of others as one's own. Plagiarism includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source. Examples of sources from which the ideas, expressions of ideas or works of others may be drawn from include but are not limited to: books, articles, papers, literary compositions and phrases, performance compositions, chemical compounds, art works, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, and material on the Internet.

The University Senate defines plagiarism as “*presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own.*” This can include:

- reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source;
- submitting a take-home examination, essay, laboratory report or other assignment written, in whole or in part, by someone else;
- using ideas or direct, verbatim quotations, or paraphrased material, concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings;
- failing to acknowledge sources through the use of proper citations when using another's works and/or failing to use quotation marks;
- handing in "substantially the same piece of work for academic credit more than once without prior written permission of the course instructor in which the submission occurs."

Plagiarism is a serious offence that cannot be resolved directly by the course's instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

(see: <http://www2.carleton.ca/studentaffairs/academic-integrity> and <http://www.library.carleton.ca/help/avoid-plagiarism>)

**Other Important Locations on Campus:**

Paul Menton Centre (501 University Centre) for students needing accommodation

Writing Services <https://carleton.ca/csas/writing-services/> (4<sup>th</sup> Floor, Library)

Centre for Student Academic Support <https://carleton.ca/csas/> (CSAS, 4<sup>th</sup> Floor, Library)

**CLASS SCHEDULE, TOPICS AND READING LIST (Subject to modification!!)**

Month	Day	Topic	Dessler	IPCC
Jan	8	01 – Introduction to the course and climate change	1.1, 1.2	TS-1
	8,9	<b>Lab 1 – Paper topic and article synthesis (A237)</b>		
	15	02 – Energy balance and the climate system	Chapter 3, 4.1-4.3	
	22	03 – Evidence for modern climate change	2.1	SPM-B1-4; TS-2.1-2.7
	22,23	<b>Lab 2 – Recent climate (A237)</b>		SPM-B1-4; TS-2
	29	04 – GH gas and climate forcing	4.3, Chapter 5, 8.4	SPM-B5, C, Box SPM1; TS-2.8, 3, Box TS-6
Feb	5	05 – Climate models	Chapter 8	SPM-D1-D4; Box TS-4, TS-5, TFE.3
	5,6	<b>Lab 3 – Science writing and paper outline (A237)</b>		
	12	06 – Feedbacks and the climate system	6.1	SPM-D2; TFE-6
	12,13	<b>Lab 4 – Future climate (part 1) (A237)</b>		
	19	READING WEEK (no class)		
	26	07 – Lessons from past climate	2.2	Box TS.5
	26,27	<b>Lab 4 – Future climate (part 2) (A237)</b>		SPM E
Mar	4	08 – Impacts and consequences	Chapter 9	SPM E; TFE-5
	11	09 – Attribution of climate change	Chapter 7	SPM-D3
	12,13	<b>Lab 5a – Seminar (part 1) (A211)</b>		
	18	10 – Ozone layer / internal climate variability / TBD	13.3, 7.4	TS-2.
	19,20	<b>Lab 5b – Seminar (part 2) (A211)</b>		
	25	11 – Guest lecture	-	
	29	<b>Term paper due @ 23:55</b>		
Apr	1	12 – Climate science and society/Review	Chapter 14 (loosely), 1.4	SPM-E8, TFE-8
	8	<b>13 – In class test</b>	-	

IPCC – SPM is the Summary for policymakers, TS is the Technical Summary, TFE is Thematic Focus Elements (found within the TS). Boxes can be found in both the SPM and TS.

<b>LECTURES:</b>		Wednesdays	08:35 - 10:25	University Centre 378
<b>LABORATORY:</b>	A2	Wednesdays	11:35 - 13:25	Loeb A237/A211
	A1	Thursday	08:35 - 10:25	Loeb A237/A211