Climate Change: An Earth Science Perspective

ERTH 2402 (Fall 2024)

Instructor:	Joanna Northover (She/They)
Department:	Earth Sciences
Email:	joanna.northover@carleton.ca
Student Hours:	Fridays 1:00 – 2:00pm, Rm 2125 HB (Herzberg Laboratories), or virtually by appointment on Zoom
Lecture Times:	Tuesdays, 2:35 – 5:25pm (held in-person)
Lecture Location:	Rm 103, Steacie Building
Brightspace:	https://brightspace.carleton.ca/d2l/home/221794
T.A.:	Eleanor Spence (eleanorspence@cmail.carleton.ca) - Exam Marking, and Online Quiz coordinator

Course Description: An exploration of the, often dramatic, climate changes that have occurred through Earth's history from a geological perspective, emphasizing the history of Earth's climates, geological causes of climate change and impact that rapid climate change has had on the biosphere.

Prerequisite(s): None

Learning Outcomes:

- Understand the evolution of humans' awareness of climate change and describe the impact of rapid and slow climate change events on human civilizations.
- Recall the climate cycles and trends that are recognizable in the Holocene climate record.
- Understand how climate proxies are used to reconstruct past climate systems.
- Understand and describe geological process and concepts associated with interpreting paleoclimates (e.g. plate tectonics, sedimentary facies, radiometric dating, geologic time scale, etc.)
- Understand and describe the links between atmosphere and oceanic circulation and how they are critical parts of the Earth's climate system.
- Understand and describe the causes and impact that El Niño and other cyclic climate phenomena have on climate.
- Understand the impacts of glaciation on climate and recall the major climatic events, and pattern of glacial and interglacial periods, of the Quaternary.
- Understand and describe the link between climate change and extremely rapid (often catastrophic) events (e.g. meteors, volcanoes, etc.)
- Understand the carbon cycle and how different greenhouse gases effect global climate.
- Recall the wide variety of climates that have developed on other planets and moons in the solar system.

Tentative Course Schedule*:

WEEK	DATE	LECTURE TOPIC	Online Assignments
1	Sep 10	Introduction & Unit 1: Climate Change and Civilization	
2	Sept 17	Unit 1: Climate Change and Civilization (part 2)	Assignment 1
3	Sept 24	Unit 2: Reading the Rocks	
4	Oct 1	Unit 2: Reading the Rocks (part 2)	Assignment 2
5	Oct 8	Unit 3: Glaciers Come and Go	
6	Oct 15	**Midterm Exam (in class)**	
7	Oct 22	***Fall Break – NO CLASS***	
8	Oct 29	Unit 4: Ocean and Atmosphere	Assignment 3
9	Nov 5	Unit 5: Weather and Climate Cycles	
10	Nov 12	Unit 6: Geologic Causes of Climate Change	Assignment 4
11	Nov 19	Unit 7: Here Comes the Sun	
12	Nov 26	Unit 8: Greenhouse Gases	Assignment 5
13	Dec 3	Unit 9: Extra Terrestrial Climates & **Final Exam Review**	Bonus Assignment

*Lecture topics may change or be adjusted during the term. See Brightspace for updated schedules, and weekly textbook readings.

Learning Materials:

Textbook: There is no physical textbook assigned for this course. Supplementary readings for class will be mostly drawn from several free online textbooks. You can access these textbooks anytime online and some are available to download (in various formats) through the URLs listed below. Links to specific weekly readings (available from the online textbooks or through ARES) will be posted on Brightspace here (under "Weekly Readings and Supplemental Study Materials").

Introduction to Climate Science – by Andreas Schmittner
https://open.oregonstate.education/climatechange/

Environmental Geology – by Steve Earle
https://environmental-geol.pressbooks.tru.ca/

Historical Geology - by Callan Bentley, Karen Layou, Russ Kohrs, Shelley Jaye, Matt Affolter, and Brian Ricketts https://opengeology.org/historicalgeology/

Technology Checklist:

- ☐ An internet-enabled computer (laptop/desktop)
- ☐ Access to reliable internet
- ☐ A smart phone to participate in WooClap activities (a laptop could also be used)

Assessments*

Research about learning strongly suggests that the most important factor in learning new material is doing the work of reading, writing, recalling, practicing, synthesizing, and analyzing. Learning happens best when people actively engage material on a consistent basis, and that is why we have high standards in this course. Consistent lecture attendance, and active participation in in-class activities, is important to stay engaged with the course materials. We are confident that, with appropriate effort, you **all** can meet the standards for this course.

We will also try to reduce unintentional bias in grading by using methods such as grading assignments one question at a time (i.e., grading all of question 1 before grading any of question 2), grading anonymously, and using rubrics when appropriate.

Grading Breakdown:

Lecture Midterm	25%	(held in-class **Oct. 15, 2024**)
Lecture Final Exam	30%	(held during the Final Exam period, date TBA)
Brightspace Quizzes	25%	(5 assessments worth 5% each)
Infographic Project	15%	(Outline Due **Oct. 31;** Project due **Nov. 29, 2024** at **11:59pm**)
Participation	5%	(Attendance tracked with WooClap event participation)
Extra Credit	2%	(One bonus Brightspace quiz)

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.

Midterm Exam (25%)

The lecture midterm exam will be held in-person *during scheduled lecture time* on **Tuesday October 15, 2024**, and is closed book. The midterm will cover lecture material and videos from weeks 1-5 (Unit 1-3). See the "Accommodation" section for instructions for missed midterm exams.

Final Exam (30%)

The final lecture exam will be closed book and will be held in-person during the formally scheduled final exam period (date TBA). It will cover lecture and video material from weeks 6 – 13 (Unit 4-9). If you miss the final exam, you must notify the registrar's office through the formal deferral process.

Brightspace Quizzes (25% + 2% Bonus)

The Brightspace quizzes and assignments will draw from, and supplement, material covered during lecture. They will made available Tuesdays on Brightspace after scheduled lecture time, and you will have one week to complete the assignment before it closes the following Tuesday at 2:00pm. Check the course schedule for assignment release dates. There will be 5 online assignments total worth 5% each of the final grade. There will be one optional quiz made

available for 1 week after the final lecture that will count for extra credit worth 2% bonus toward your final grade. Questions regarding the online assignments, or requests for accommodations due to missed assignments, should be directed to the Teaching Assistant (eleanorspence@cmail.carleton.ca).

Participation (5%)

Participation will be scored for lecture attendance using Wooclap. Multiple WooClap activities and questions will be shown during each lecture and responding will count towards your overall 5% participation final grade. The lowest 2 Wooclap event grades will be dropped to account for unexpected absences during the term. WooClap participation will begin to officially count towards the final grade in week 3, to allow time for students to familiarize themselves with WooClap, and any late registrations to the course. A link to weekly WooClap events for this course is located on the course Brightspace page here.

Infographic Project (15%)

Full project descriptions and marking rubrics are posted on Brightspace here. The written outline of your infographic is due **Thursday, October 31, 2024** at **11:59pm**. The final assignment is due **Friday, November 29, 2024** at **11:59pm.**

Accommodation

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (students.carleton.ca/course-outline).

For specific accommodation requests for this course the processes are as follows:

General Accommodation Guidelines

Short term conflicts with any course requirement (exam, online assignments, etc.) due to illness or other circumstances MUST be reported to me (or the TA when applicable) PRIOR to the due date whenever possible. If this is not possible, contact regarding a deferral/accommodation must be made within **72 hours of the missed deadline (48 hours if you miss the Midterm)** to request an accommodation or extension.

The standard extension for assignments will be **24 hours** from when accommodation is granted barring any extenuating circumstances (see exam section below for exam specific extensions/accommodation). If no contact is made, or contact is made after the 72hr window, a standard deduction of 5% per day, up to 10 calendar days, will be applied to any late work. Work will not be accepted 10 calendar days after the due date.

Missed Lectures
If you are sick, or have been exposed to COVID 19, please do not come to class in person! All lecture slides will be uploaded to Brightspace weekly and any questions about the material can be answered during student hours. You are **not** required to notify the instructor if you missed a lecture, as up to 2 absences will not affect your participation grade.

Note Regarding COVID-19/Respiratory Illness
Carleton University has suspended the need for a doctor's note or medical certificate until further notice when requesting academic accommodation related to COVID-19. Students should complete the self-declaration form available on the Registrar's Office website to request academic accommodation (https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf). Note that the timing for submitting a self-declaration to your instructor is the same as outlined in the "**General Accommodation Guidelines"** section above.

Brightspace Quizzes
Technical issues, or other unexpected circumstances, which prevent you from completing the online assignments should be communicated directly to the TA as soon as possible when they occur. If you miss an assignment deadline you have until **72 hours** after the due date to contact the TA to request a 24 hour extension. Assignments are available to complete for 1 week, so begin them early to avoid late submission penalties.

Final Project (Infographic)
If you require accommodation or assistance with any portion of the term project, please reach out to the course instructor ASAP. Late project submissions will lose 5% per calendar day. An assignment can no longer be submitted 10 days following its initial deadline.

Exams
For students who miss the in-class **MIDTERM EXAM**, they must contact me within **48 hours** to request to write a deferred Midterm exam. Students who have been granted accommodation will have an opportunity to write the deferred midterm BEFORE the start of Fall Break (exact date, time, and location of deferred exam TBA)

If you miss the **FINAL EXAM** you must follow the instructions on the Registrar's website for Deferred Exams which can be found here: https://carleton.ca/registrar/deferral/.

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 accommodation regarding a formally-scheduled final exam, you must complete the Pregnancy Accommodation Form https://carleton.ca/equity/contact/form-pregnancy-accommodation/

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 https://carleton.ca/equity/focus/discrimination-harassment/religious-spiritual-observances/

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 for a formal evaluation. If you are already registered with the PMC, please request your accommodations for this course through the Ventus Student Portal 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*). Requests made within two weeks will be reviewed on a case-by-case basis. For final exams, the deadlines to request accommodations are published in the University Academic Calendars. 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).

Survivors of Sexual Violence
As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/equity/sexual-assault-support-services

Accommodation for Student Activities
Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. 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. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

Academic Regulations & Policies

University Grading Regulations*
In accordance with the Carleton University Undergraduate Calendar Regulations, the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59
A = 85-89	B = 73-76	C = 63-66	D = 53-56
A- = 80-84	B- = 70-72	C- = 60-62	D- = 50-52
F = <50			

WDN = Withdrawn from the course
DEF = Deferred

Academic Integrity*
Academic Integrity is upholding the values of honesty, trust, respect, fairness, responsibility, and courage that are fundamental to the educational experience. Carleton University provides supports such as academic integrity workshops to ensure, as far as possible, that all students understand the norms and standards of academic integrity that we expect you to uphold. Your teaching team has a responsibility to ensure that their application of the Academic Integrity Policy upholds the university's collective commitments to fairness, equity, and integrity. (Adapted from Carleton University's Academic Integrity Policy, 2021).

Examples of actions that do not adhere to Carleton's Academic Integrity Policy include:

- Plagiarism
- Accessing unauthorized sites for assignments or tests
- Unauthorized collaboration on assignment and exams
- Using artificial intelligence tools such as ChatGPT when your assessment instructions say that it is not permitted

Please review the checklist linked here to ensure you understand your responsibilities as a student with respect to academic integrity and this course.

PLAGIARISM
The University Academic Integrity Policy defines plagiarism as "*presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one's own.*" This 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, artworks, laboratory reports, research results, calculations and the results of calculations, diagrams, constructions, computer reports, computer code/software, material on the internet and/or conversations.

Examples of plagiarism include, but are not limited to:

- any submission prepared in whole or in part, by someone else, including the unauthorized use of generative AI tools (e.g., ChatGPT);
- using ideas or direct, verbatim quotations, paraphrased material, algorithms, formulae, scientific or mathematical concepts, or ideas without appropriate acknowledgment in any academic assignment;
- using another's data or research findings without appropriate acknowledgement;
- failing to acknowledge sources through the use of proper citations when using another's work and/or failing to use quotations marks.

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.

AI use in this course:*

Students may use AI tools for basic word processing and formatting functions, including:

- Grammar and spell checking (e.g., Grammarly, Microsoft Word Editor)
- Basic formatting and design suggestions (e.g., Microsoft Word's formatting tools, PowerPoint Design editor)

Documenting AI Use: It is not necessary to document the use of AI for the permitted purposes listed above. If you have questions about a specific use of AI that isn't listed above, please consult your instructor.

Why have I adopted this policy? This policy ensures that student voices and ideas are prioritized and authentically represented, maintaining the integrity of the work produced by students while allowing basic support to enhance clarity, correctness, layout, and flow of ideas. The goal of adopting a limited use of AI is to help students develop foundational skills in writing and critical thinking by practicing substantive content creation without the support of AI.

Limitations: Students may not use AI for the following tasks:

- Generate an outline or summary of academic papers for their Infographic project
- Generate response to quiz questions, even if the student subsequently modifies them

Sanctions for Not Abiding by Carleton's Academic Integrity Policy*

A student who has not upheld their responsibilities under Carleton's Academic Integrity Policy may be subject to one of several sanctions. A list of standard sanctions in science can be found here.

Additional details about this process can be found on the Faculty of Science Academic Integrity website. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy. The Policy is strictly enforced and is binding on all students.

Student Rights & Responsibilities*

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Student Concerns*

If a concern arises regarding this course, **your first point of contact is me**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):



Note: You can also bring your concerns to Ombuds services.

Assistance for Students

Student Mental Health

As a University student, you may struggle with mental health challenges. These can impact your academic success, but more importantly your well-being. If you are struggling or feel you need help, please reach out. If you are struggling with the course, don't hesitate to come and chat with me during student hours or send me an email so I can help.

There are numerous resources available both on- and off-campus to support you. For a list of resources available to you visit (https://carleton.ca/wellness/)

Other Helpful Student Resources

Academic and Career Development Services: http://carleton.ca/sacds/
Writing Services: http://www.carleton.ca/csas/writing-services/
Peer Assisted Study Sessions (PASS): https://carleton.ca/csas/group-support/pass/
Math Tutorial Centre: https://carleton.ca/math/math-tutorial-centre/
Science Student Success Centre: https://sssc.carleton.ca/

*Indicate portions of this outline that were adapted, or included, from the EDI Syllabus Template written by Dr. Ashley Thompson