

PHY 2203 - Earth's Climate and Carbon Cycle!

Quest University, Block 3, Fall 2014

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Location and Times: AC1, Room 111, Daily 1:00pm to 4:00pm

COURSE DESCRIPTION

Earth's Climate and Carbon Cycle will focus on the various mechanisms and processes that control variability in Earth's climate over very short (decadal) to very long (tectonic) timescales. Determining the causes of climate variability in Earth's past is crucial for understanding present climate and for predicting future changes. This course focuses on the modes and drivers of climate, including ocean circulation, solar insolation, greenhouse gases, and ice sheet dynamics. We examine paleoclimate records and investigate methods for studying paleoclimate, including field trips to local sites in search of evidence of past climate conditions in the geomorphic and rock records. Particular attention is paid to CO₂ and the role of the carbon cycle in the climate system. The final project for this course will be focused on building media to effectively communicate climate science with members of our local community in the Sea to Sky corridor.

Prerequisites: Information, Measurement and Algebra Q Skills Strands.

COURSE OBJECTIVES

- **Comprehend the use of and proper practices of quantitative measurements and estimation in the physical sciences (QNT).**
- **Foster a proper attitude towards answering relevant physical science questions with evidence and observations, not opinion (OBS).**
- **Develop an appreciation for the relevance of course subject matter in the context of everyday society (SOC).**
- **Analyze multivariable concepts and place them in context of the interconnectedness of natural systems (SYS).**
- **Summarize and communicate physical science data and hypotheses to diverse audiences (COM).**
- **Comprehend that the practice of physical science is one in which hypotheses are continually being tested, even their own (EPI).**

COURSE DETAILS

Assessment & Grading

The grade for PHY2203 is based upon:

Field and Lab Assignments	30%
Participation (Active and Engaged!)	15%
Celebrations of Knowledge (Exams)	20%
Final Climate Connections Project	35%

What is meant by participation?

Obviously to get any participation points you must attend. However, mere attendance is not enough. I expect that you will come to class prepared and ready to actively participate (ask and answer questions). You need to be actively involved in hypothesis development and testing, particularly when developing questions at the numerous field sites we will visit. If you are unable to attend any part of the class, obtain permission beforehand, unexcused absences will be a loss of participation points and 3 unexcused absences will equate to an overall failing grade for the course.

Field Trips

On the field trips be prepared for the weather and terrain. This course offers unique options for outdoor exposure to geologic learning opportunities; because of this outdoor nature increased risk is inherent. To mitigate this increased risk I am trained as a Wilderness First Responder. Please inform me of prior medical conditions that may affect your safety in an outdoor, mountain setting to ensure rapid support in case of injury or illness. We will be using Quest University vehicles to transport students. Because parking is limited at many field trip stops, **you will not be permitted to drive personal vehicles on the field trips.**

For any conflicts related to meetings (i.e. family, religious holidays, or medical reasons)—see me!

Supplies, clothing, and field expectations/concerns will be discussed in detail the first day of class. The better prepared you are, the more comfortable you will be under the range of weather possible. Additionally, besides personal clothing (listed below), **each student will be expected to acquire the following** field equipment:

- Waterproof field notebook (size ~5x8 inches)
- Pencils with hard led for writing in field notebook
- Colored pencils (at least a few colors; e.g. red, blue, green, brown)
- Calculator (trigonometry-capable, most phones provide this)

General gear:

- Large daypack (we will have many short daytrips, and with the rapidly-changing mountain weather it is important to have space for EXTRA LAYERS...oh, and SNACKS!!!)

Clothing:

- Water-resistant outwear (rain pants/bibs, ski-jacket/rain-jacket)
- Field boots—**water ready!**
- Warm hat (tuque), pile or wool (anticipate cold and wind)
- Gloves and an extra pair (or two)
- A set of warm layers: a pullover (wool or pile), and outwear, including an insulated jacket.

Office Hours and Requesting Additional Help

As an instructor I will be available most times during the day to answer questions and provide support. On campus, feel free to call, text, or e-mail to arrange a time to meet; mornings are good but evenings are generally okay too; after class is probably the best.

Responsible Conduct

As members of the Quest University community, all school policies regarding drug and alcohol use must be followed at all times.

Honor Pledge

Students are expected to uphold and adhere to the Quest University Honor Pledge, in every respect, as is the case for all courses at Quest. Your responsibilities include, but are not limited to, doing all of your own work on quizzes, exams, lab exercises, and papers, unless the instructions state otherwise for group activities and projects. In addition you must take care to acknowledge all sources of information you use in reports and write-ups (print literature; internet; and other).

Guidelines for Acknowledgement of Literature and Internet Sources

Use of Internet sources for research and reading is encouraged—however, students must take extreme care not to plagiarize and to scrupulously credit all internet sources with clear and obvious citations, for diagrams and textual materials. To avoid plagiarism, present material learned from electronic sources in your own words, and cite the source of the material (guidelines for citation are below).

Presentations and documents should cite all sources on the page where the information appears, with the URL in small font at bottom of page. Complete list of website titles, URL, and date accessed should be provided in a list at end.

Written papers should cite (author, year) within the text, with full reference list provided at end of paper.

The guidelines for paper preparation and citation style can be found at:

<http://www.geosociety.org/pubs/geoguid5.htm>

Note that the table at the bottom of that webpage has clickable links to "Samples of different reference styles."

Citation of on-line resources should be in this format suggested by the American Chemical Society:

1. Uniform Resource Locators (URLs) for Web Pages

Format: Author, if available. Title of page as listed on the site. Address of page (date accessed).

Example: Lichtman, J.. American Chemical Society (ACS) Citation Style for Internet Sources. <http://www.lv.psu.edu/jkl1/chem/citing.html/> (accessed Sept.2005).

2. Online Periodical Article

Format: Author(s), Year, Title of article. *Journal name*, volume (number), Digital Object Identifier. URL.

Example: Luyendyk B. P., Wilson D. & Siddoway C.S., 2003. The eastern margin of the Ross Sea Rift in western Marie Byrd Land: Crustal structure and tectonic development. *Geochemistry, Geophysics, Geosystems (G3)*, 4 (10), 1090, doi:10.1029/2002GC000462.

COURSE SCHEDULE:

Date	Topic	Activities & Assessments	Objectives Met
Week 1			
Mon, 27 th	Course overview, Predicting the Future - Analogues and projections	<input type="checkbox"/> Overview reading on climate and carbon <input type="checkbox"/> Choose block representative	SOC, SYS
Tue, 28 th	How we understand the Earth System - Observation, quantification, theory, and scale	<input type="checkbox"/> Field learning (on campus) <input type="checkbox"/> Scientific Reading and Synthesis <input type="checkbox"/> <i>Field Data 101</i>	QNT, EPI, OBS
Wed, 29 th	Climate Drivers - Global heat flows (<i>solar insolation, greenhouse effect, ice sheet dynamics (feedback loops)</i>)	<input type="checkbox"/> Field learning and concept/reading review (on campus) <input type="checkbox"/> <i>Quantifying Fluxes - Part 1</i> <input type="checkbox"/> Tutor feedback survey	QNT, SYS, OBS
Thu, 30 th	Climate Drivers - Global water cycles (<i>ocean circulation, terrestrial water balance, watersheds</i>)	<input type="checkbox"/> Field learning and concept/reading review (on campus) <input type="checkbox"/> <i>Quantifying Fluxes - Part 2</i> <input type="checkbox"/> Anjali Appadurai on <i>Climate Change and Social Justice</i> - AC322 - 7:00pm	QNT, SYS, OBS
Fri, 31 st	Climate Drivers - Global carbon cycles (<i>sequestration, photosynthesis, respiration, volcanics</i>)	<input type="checkbox"/> Field learning and concept/reading review (on campus) <input type="checkbox"/> Practice Party! (a.k.a. not-for-credit quiz)	QNT, SYS, OBS
Week 2			
Mon, 3 rd	Past Climate - Paleoclimatic data and methods	<input type="checkbox"/> <u>Celebration of Knowledge 1</u> <input type="checkbox"/> Field learning (on campus) <input type="checkbox"/> <i>Tree Rings as Climate Record</i>	QNT, SYS, OBS
Tue, 4 th	Past Climate - Geomorphic record and rock record	<input type="checkbox"/> Field learning (off campus), possible early departure (TBD) <input type="checkbox"/> <i>Field Mapping Project</i>	QNT, SYS, OBS
Wed, 5 th	Current and Future Climate - Impacts assessment, remote sensing, and natural resources (<i>global</i>)	<input type="checkbox"/> Field learning (on campus) <input type="checkbox"/> <i>Remote Sensing Lab</i> <input type="checkbox"/> "Focus group" for tutor feedback	SOC, SYS
Thu, 6 th	Current and Future Climate - Impacts assessment, rem. sensing, & nat. resources (<i>local</i>)	<input type="checkbox"/> Field learning (off campus), possible early departure (TBD) <input type="checkbox"/> <i>Change Polarity Essay</i>	SOC, SYS, OBS

Fri, 7 th	Science Communication and Community Engagement	<ul style="list-style-type: none"> <input type="checkbox"/> <i>In-class Discussion: The Role of Scientists in Policy and Advocacy</i> <input type="checkbox"/> Introduce final Climate Connections Project 	COM, SOC
Week 3			
Mon, 10 th	Current and Future Climate - Mitigation options and challenges (<i>global</i>)	<ul style="list-style-type: none"> <input type="checkbox"/> <u>Celebration of Knowledge 2</u> <input type="checkbox"/> Assign <i>Mitigation and Adaptation Essay</i> 	SOC, SYS
Tue, 11 th	Current and Future Climate - Adaptation options and challenges (<i>local</i>)	<ul style="list-style-type: none"> <input type="checkbox"/> Field learning (off campus), possible early departure (TBD) <input type="checkbox"/> Work on <i>Mitigation and Adaptation Essay</i> 	SOC, SYS
Wed, 12 th	Current and Future Climate - Adaptation options and challenges (<i>global</i>)	<ul style="list-style-type: none"> <input type="checkbox"/> Work on <i>Mitigation and Adaptation Essay</i> - Due 1pm Thu. 	SOC, SYS
Thu, 13 th	Climate Connections Project - Methods of communication, group brainstorming, plans of action (outlines)	<ul style="list-style-type: none"> <input type="checkbox"/> Project work <input type="checkbox"/> Prepare <i>outlines</i> 	COM, SOC, EPI, QNT, SYS
Fri, 14 th	Climate Connections Project - Consultations	<ul style="list-style-type: none"> <input type="checkbox"/> Consultations, present <i>outlines</i> <input type="checkbox"/> Project work 	COM, SOC, EPI, QNT, SYS
Week 4			
Mon, 17 th	Climate Connections Project	<ul style="list-style-type: none"> <input type="checkbox"/> Project work, consultations if needed <input type="checkbox"/> Finalize <i>1st drafts</i> 	COM, SOC, EPI, QNT, SYS
Tue, 18 th	Climate Connections Project - Draft review	<ul style="list-style-type: none"> <input type="checkbox"/> Reviews of <i>1st drafts</i> <input type="checkbox"/> Project work <input type="checkbox"/> Prepare <i>final drafts</i> 	COM, SOC, EPI, QNT, SYS
Wed, 19 th	Climate Connections Project - Presentations	<ul style="list-style-type: none"> <input type="checkbox"/> Final showing and presentation of projects <input type="checkbox"/> Course evaluations 	COM, SOC, EPI, QNT, SYS