GLY 579: Climate Change

Spring 20xx 3 credit hours

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http://web.cortland.edu/barclayd/paleoclimate/579_index.htm

Office hours: M 11:30 am - 1:30 pm; T 2:00 - 4:00 pm; W 11:30 am - 12:30 pm
or by appointment, or at other times if I am available.

Lecture: 136 Bowers; Tu, 4:20 - 6:50 pm

Textbook: Wilson, R.C.L., Drury, S.A. and Chapman, J.L., 2000, The Great Ice Age. Routledge, 267 pp.

Catalog course description:

"(C) The science of climate change. Emphasis on events, environments and climatic forcings over the past two million years. Prerequisite: GLY 261 and 12 hours of natural science (geology, biology, chemistry or physics) at 300 level or above. (3 cr. hrs.)".

Course attendance policy:

I expect you to attend all class sessions. Please familiarize yourself with official college policy regarding attendance and absences (Section 410.12 of the College Handbook).

Be responsible for your own education. If you miss a class, get the notes from a colleague as soon as possible. If you miss an exam or assignment, you must contact me as soon as possible with a valid reason for your absence or you will receive a zero for that work. Ask questions and get involved in class discussions; your participation and attitude will be used to aid final grade determination in borderline situations.

Evaluation of student performance:

There will be a midterm and a final exam in this course (see schedule on page 3). These will respectively be worth 30% and 40% of your final grade. Material on these exams will be based on the material covered in lecture, in exercises and in homework assignments since the previous exam. Each exam will comprise a mix of multiple-choice, short answer and data analysis questions. The remaining 30% of your grade will come from the average of your in-class exercises and homework writing assignments.

Academic integrity:

I expect you to abide by the SUNY Cortland standards of academic integrity (Chapter 340 of the College Handbook). Stated simply, this means that you will not commit plagiarism, nor cheat on exams, nor help others plagiarize or cheat.

Academic accommodations:

If you are a student with a disability and wish to request accommodations, please contact the Office of Student Disability Services located in B-40 Van Hoesen Hall or call (607) 753-2066 for an appointment. Information regarding your disability will be treated in a confidential manner. Because many accommodations require early planning, requests should be made as early as possible.

Course objectives:

Climate is always changing. While human-induced climate change is of considerable concern today, it is important to realize that climate also changes naturally over a range of timescales, and that these changes can also have a profound impact on society. This course will help you understand the nature and causes of natural climate change by focusing on climate change in the past. We will consider how Earth's climate system operates through interactions of physical, chemical and biological systems, and also explore some of the methods by which paleoclimatologists decipher past climates.

By the end of this course I expect you to be able to do the following (the lectures and assignments that specifically address each objective are in italics; numbers following each course objective are NYSED Sub Area standards):

1. Explain the factors controlling climate and climate change. [0001, 0009, 0013, 0014, 0017, 0025]
   Lectures, exercises & papers throughout the course.

2. Summarize how climate and North American terrestrial environments have changed during the Quaternary. [0022]
   Lectures, exercises & papers throughout the course.

3. Describe the key developments in the science of paleoclimatology. [0002]
   Lectures, exercises & papers throughout the course.

4. Explain how humans may be changing climate. [0002, 0005, 0018]
   Lectures, exercises & papers in April.

5. Analyze and interpret paleoclimate data. [0001, 0004, 0006]
   Exercises & papers throughout course.

6. Synthesize and critique data and ideas from peer-reviewed literature. [0004]
   Papers throughout course.

SUNY Cortland Conceptual Framework:

This course addresses Learning Outcome 2 of the SUNY Cortland Conceptual Framework. Specifically, students will develop in-depth knowledge of the science of Paleoclimatology.

Assessment of objectives:

	Course objectives (NYSED):						NSTA standard:				
Graded work:	1	2	3	4	5	6	1a	1d	2a	3a	4a
Midterm	✓	✓	✓		✓		✓	✓			
Final exam	✓	✓	✓	✓	✓		✓	✓			✓
Paper summaries		✓		✓		✓			✓	✓	
Exercises					✓			✓		✓	

Reading assignments:

Recommended reading assignments, including online sources, for every class will be posted on the course website (http://web.cortland.edu/barclayd/paleoclimate/579_index.htm). This list will be updated regularly so please keep checking back throughout the semester.

Laboratory equipment:

Please bring a scientific calculator, a 12" ruler, a sharp pencil, an eraser and your textbook to every class.

Course outline:

Week	Date	Lecture	Details
01	29 Jan.	Climate system science	• Global energy balance & the greenhouse effect • Climatic controls & bioclimatic zones • Proxy records – age control & interpretation
02	5 Feb.	Marine cores	• Obtaining marine cores, age control & climatic proxies • Oxygen isotope records & MOIs
03	12 Feb.	Orbital forcing	• Time series analysis • Orbital variations (Milankovitch cycles)
04	19 Feb.	Ice sheets	• Ice sheet growth & decay & feedbacks • Ice sheet dynamics & 100ka cycles
05	26 Feb.	Greenhouse gases	• CO_2 & CH_4 as greenhouse gases • GHG dynamics over millions to thousands of years
06	4 Mar.	**MIDTERM EXAM**	
-	11 Mar.	SPRING BREAK	
07	18 Mar.	Lake cores & pollen	• Obtaining lake & bog cores, age control & climatic proxies • Palynology (pollen records)
08	25 Mar.	Pollen paleoecology	• Interpretation of pollen records & transfer functions • Micro & macrofossil records of late glacial oscillations
09	1 Apr.	Ice cores	• Obtaining ice cores, age control & climatic proxies • Younger Dryas & other late glacial climatic events
10	8 Apr.	Millennial oscillations	• Dansgaard-Oeschger oscillations & Heinrich events • Meridional overturning circulation & Bond cycles
11	15 Apr.	The Holocene & dendrochronology	• Holocene climate events • Valley glaciers & dendrochronologic dating
12	22 Apr.	Dendroclimatology	• Tree-ring formation, core collection & processing • Dendroclimatic interpretation
13	29 Apr.	Historical climate change	• Historical climate change • Solar output, volcanoes, human pollution
14	6 May	Global warming	• GCM models & attribution • The future
15	13 May	**FINAL EXAM**	