

Geography Geology 308/508

CLIMATE: PAST, PRESENT AND FUTURE

Spring 2023

Instructor: Samantha Kaplan

Office: D-327 Science Building

Office Hours: Tuesdays 11-12, Thursday 2-3, and by appointment

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Required Rental Textbook:

- Ruddiman, William, 2014. *Earth's Climate, Past and Future* (third ed.). New York: W.H. Freeman and Company, 445 p.

Online Textbooks

- Bloom, Arnold, 2020, *Climate Change Causes Consequences and Solutions*. University of California-Davis. Licensed under the Creative Commons. <https://indd.adobe.com/view/8f2ed4a1-a1b0-4f12-b5bb-5009bbbad0f3>
- Schmittner, Andreas, 2018, *Introduction to Climate Science*. Corvallis: Oregon State University Ecampus. 245 p. Licensed under the Creative Commons. <https://open.oregonstate.education/climatechange/>
- Weart, Spencer, 2022, *The Discovery of Global Warming*. The American Institute of Physics. <https://history.aip.org/climate/index.htm>

Students with Disabilities: Students with learning and/or physical challenges that make classroom learning difficult are encouraged to contact me right away (in addition to Disability Services) to make special arrangements for taking lecture notes or exams.

Course Description: 3 Credits. Earth's climate is always changing. Different factors, including geological, astronomical, atmospheric, oceanic, biological, and human, operate at different time scales to change the climate of our planet. This course focuses on evidence of climate change in the past, modern climate variability, and the range of theories and arguments regarding future climate scenarios. We will study the field and research methods used to investigate past climate, as well as how climate models are used to explore future climatic trends, including global warming.

Learning Outcomes: Upon completion of this course:

- Students will be able to explain the workings of earth's climate system and the processes affecting climate over timescales ranging from years to millennia.
- Students will be able to demonstrate how interactions among the atmosphere, oceans and land combine to influence climate.
- Participants will be able to recognize how humans have affected the climate and be able to identify how past climate changes can be used to understand possible future climate change.
- Students will acquire the necessary tools and background to decipher climate change fact from fiction and make informed decisions about future climate policy.

Student rights and responsibilities

- UWSP has guidelines regarding student rights and responsibilities in class and on campus. These are outlined on the Dean of Student's website and in the Student Handbook. Do review these resources if you have not already:
 - <https://www.uwsp.edu/dos/Pages/stu-conduct.aspx>
 - <https://www.uwsp.edu/dos/Pages/stu-academic.aspx>
 - <https://www.uwsp.edu/dos/Pages/handbook.aspx>
 - <https://www.uwsp.edu/dos/Documents/AcademicIntegrityBrochure.pdf>
 - <https://www.uwsp.edu/dos/Documents/UWSP14-Final2019.pdf>

Classroom Policies

- No talking, texting, scrolling, surfing, or listening to music during class. This is disruptive and discourteous to your peers and to the professor. Phones and other electronic devices must be turned off. Laptops and tablets may be used for note-taking, but only with prior approval. Any student found violating these rules will be asked to leave the classroom.
- Attendance is required at all class sessions and counts towards your grade. If you have to miss class, it is your responsibility to inform the instructor ahead of time and get notes from a peer.
- I do not post lecture notes on-line and I do not share my lecture notes with students. Please do not ask. If you miss class, it is your responsibility to get the notes from a classmate. I will post Power Point lecture slides following class (not before).

Grades

		Percent	Letter Grade
• Evaluation		≥93	A
		90-92.9	A-
Exams (3 @ 13% ea)	39%	87-89.9	B+
Attendance	8%	83-86.9	B
Exercises (7 @ 6% ea)	42%	80-82.9	B-
Other Assignments	11%	77-79.9	C+
Total	100%	73-76.9	C
		70-72.9	C-
Final Letter Grades: Letter grades will be assigned as follows:		67-69.9	D+
		63-66.9	D
		≤62.9	F

Class Schedule (Tentative)

Date	Class Topic	Reading	Assignment Due
T 24-Jan	Course overview, weather vs. climate	Arnold Ch. 1	
R 26-Jan	Solar forcing	Ruddiman Ch. 1	Bryson
T 31-Jan	The atmosphere	Ruddiman Ch. 2 p. 19-39	
R 2-Feb	Greenhouse gases & aerosols	Ruddiman Ch. 20	
T 7-Feb	Earth's Energy budget	Ruddiman Ch. 2 p. 32-39	Carbon Cycle
R 9-Feb	The oceans & ENSO	Ruddiman Ch. 2 p. 40-53	
T 14-Feb	Long-term climate, Earth's thermostat	Ruddiman Ch. 4	Energy budget
R 16-Feb	Climate and plate tectonics	Ruddiman Ch. 5	
T 21-Feb	Cretaceous & Tertiary climate	Ruddiman Ch. 6, Ch. 7	
R 23-Feb	NO CLASS - Movie: Snowball Earth	The Habitable Planet	
T 28-Feb	Earth's orbit and the ice ages	Ruddiman Ch. 8	Snowball Earth
R 2-Mar	EXAM 1		
T 7-Mar	The Pleistocene and Last Glacial Maximum	Ruddiman Ch. 10	
R 9-Mar	Climate proxies and archives	Ruddiman Ch. 3 p. 55-69; Ch. 11 p. 215-218; Ch. 13	
T 14-Mar	Deglacial climate	Ruddiman Ch. 3 p. 55-69, Ch. 13	Ice cores
R 16-Mar	Holocene climate	Ruddiman Ch. 14, 15	
T 21-Mar	SPRING BREAK		
R 23-Mar	SPRING BREAK		
T 28-Mar	The last 2000 years	Ruddiman Ch. 17, Ruddiman Ch. 19	
R 30-Mar	Modern climate - what is normal?	Ruddiman Ch. 20	
T 4-Apr	Climate Data		
R 6-Apr	EXAM 2		
T 11-Apr	Scientific consensus and uncertainty,	Ruddiman Ch. 20	Time Series Analysis
R 13-Apr	The IPCC and future scenarios	Ruddiman Ch. 21, IPCC AR6	
T 18-Apr	Climate Models	Ruddiman Ch. 3 p. 69-74; IPCC AR6	Climate Data
R 20-Apr	CMIP	IPCC AR6 WG I, CMIP video	
T 25-Apr	Downscaled models and climate impacts	IPCC AR6 WG I	
R 27-Apr	Climate impacts	NCA4; IPCC AR6 WG II	Climate Models
T 2-May	International agreements		
R 4-May	Global energy infrastructure		
T 9-May	Climate adaptation and mitigation	IPCC AR6 WG II	Climate Future
R 11-May	Climate adaptation and mitigation	IPCC AR6 WG III	
R 16-May	EXAM 3 12:30 - 2:30 PM		

