

GEOS 117

Weather, Climate, and Climate Change

Spring 2020

Instructor: Prof. James Mills

Office: Julian Science Center 214 *Phone:* 658-4669 or 658-4654

Office Hours: 1:30-2:30 MWF or by appointment (see attached schedule)

COURSE OVERVIEW

This course is designed to provide you with an overview of the composition, structure, and behavior of the Earth's atmosphere in response to its orbital dynamics, oceanic influence, tectonic, and biologic activity. The course is divided into three areas; weather, climate and climate change. Weather, the natural variability of atmospheric conditions locally, regionally and globally over periods of time ranging from hours to days to years and even decades provides the data necessary to define longer term atmospheric conditions that scientists call climate. To provide a foundation for the study of climate, we will need to understand just what elements define weather (e.g., pressure, temperature, and moisture) and what types of weather systems develop from these elements (e.g., extratropical cyclones, fronts, storms, etc.).

In this course, we will carefully investigate what constitutes weather and what constitutes climate. To understand climate, we will examine how long-term atmospheric characteristics are measured and how statistics are used to understand atmospheric conditions. In addition, we will look at whether biota (including humans) change short-term and long-term atmospheric phenomena. How has climate changed over long periods of the Earth's history and what is the evidence for these changes?

In an age where the climate of Earth is currently undergoing increasingly rapid change, we will need to investigate how scientists measure the elements and characteristics of our current (and past) climate, what evidence exists that the climate is *rapidly* changing and is climate change natural, human-induced or both?

Finally, we will examine the societal response to rapid climate change, what the consequences of rapid climate change are, and what the models predict will occur in the future (short and long term).



<https://www.sciencenews.org/article/2017-solar-eclipse-atmosphere>

Texts: REQUIRED: **Earth's Climate: Past and Future**, 3rd ed., 2014, Ruddiman, W.F., W.H. Freeman and Company, New York, New York, 445 p.
ISBN 978-1-4292-5525-7

RECOMMENDED: **McKnight's Physical Geography: A Landscape Appreciation**, 12th ed., 2017, Hess, D., Pearson Education Publishing, 688 p.
ISBN-13: 978-0134195421

Note: Several copies of previous editions of this text will be on reserve in the Prevo Science Library during the Spring semester.

Class: 10:20-11:20 am MWF JSMC 223

Attendance: Regular attendance is expected for all lectures.

Projects: Occasional assignments will be given during the course of the semester. No late assignments will be accepted. The due dates will be announced at the time of the homework assignment.

Quizzes: Short quizzes will occasionally be given that cover previous lecture material, assigned readings and homework. The quizzes will be unannounced.

Exams: One-hour exams are scheduled approximately once every four weeks. See the attached lecture syllabus for the appropriate dates. **NO MAKE-UP EXAMS WILL BE GIVEN EXCEPT FOR DOCUMENTED EMERGENCIES.** The final exam will be given on the scheduled date and will be **COMPREHENSIVE**. The final exam **MAY NOT** be taken at any other time than the officially scheduled time.

Grading:	One-hour exams (3)	60%	(20% for each exam)
	Quizzes	10%	
	Final exam	20%	
	<u>Homework/Project</u>	<u>10%</u>	
	Total:	100%	

Grade Scale:	A	93-100%	C+	79-77%	D-	63-60%
	A-	92-90%	C	76-74%	F	<60%
	B+	89-87%	C-	73-70%		
	B	86-84%	D+	69-67%		
	B-	83-80%	D	66-64%		

Important Dates: Adjustment Period (Add/Drop) January 27th – February 3rd
Midterm Grades Due Monday, March 9th
Registration Adjustment Friday, March 20th (Last day to withdraw from a class with a grade of 'W', change grade from P/F to grade, or, grade to P/F)
Last Day of Class Thursday, May 7th

Academic Honesty: Any act that places a student in unfair advantage with respect to the rest of the class will be treated according to the University procedures outlined in the Student Handbook.

ADA Accommodations: It is the policy and practice of DePauw University to provide reasonable accommodations for students with properly documented disabilities. Written notification from Student Accessibility Services is required. If you are eligible to receive an accommodation and would like to request it for this course, please contact Student Accessibility Services. Allow one week's advance notice to ensure enough time for reasonable accommodations to be made. Otherwise, it is not guaranteed that the accommodation can be provided on a timely basis. Accommodations are not retroactive. Students who have questions about Student Accessibility Services or who have, or think they may have, a disability (psychiatric, attentional, learning, vision, hearing, physical, medical, etc.) are invited to contact Student Accessibility Services for a confidential discussion. Student Accessibility Services is located in Union Building Suite 208 and can be reached by phone at 765-658-6267.

Please feel free to reach out to me confidentially regarding any accommodation(s) or concerns you have about the course requirements. I'm here to help!

Diversity and Inclusion: At DePauw University, we value human diversity in all its richly complex and multi-faceted forms, whether expressed through race and ethnicity, culture, political and social views, religious and spiritual beliefs, language and geographic characteristics, gender, gender identities and sexual orientations, learning and physical abilities, age, and social or economic classes. We respect the value of every member of the class, and everyone in the class is encouraged to share his or her unique perspective as an individual, not as a representative of any category. Multicultural and intercultural awareness and competencies are key leadership skills, and we intend to present material and classroom activities that respect and celebrate diversity of thought, background, and experience.

This class may challenge your assumptions, knowledge gained from previous experience, or other beliefs and will provide new and sometimes different ways of evaluating and using evidence-based models and scientific data to look at natural processes, human impacts and related individual and societal issues. If you are concerned about any aspect of this class, I encourage you to contact me confidentially so that we can talk constructively and respectfully about your concerns.

I would like to use your preferred language when addressing you, so please let me know if your preferred name (or the pronunciation of that name) differ from what I am using and I ask that each of you let me know your preferred gender pronouns if needed. Your suggestions on how to incorporate diversity in this course in a meaningful way are appreciated and encouraged.

Adapted from: Centenary College's Diversity Statement

Religious Holy Days: DePauw University embraces the religious diversity of its students, faculty, and staff. Accordingly, faculty members are expected to excuse students from class and be flexible with respect to deadlines for required coursework in order to enable students to observe religious holy days. Faculty are also expected to make it possible for students observing holy days to make up any work they miss, provided arrangements are made in advance. Students are expected to notify their instructors of their intent to observe holy days at least one week in advance of these days. For the sake of this policy, "holy days" are defined as periods of time in which either:

- a. activities required by normal class participation are prohibited by a religious tradition, or
- b. a special worship obligation is required by a religious tradition.

Students with questions or concerns about this policy should contact the Office of Student Academic Life.

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WEEKLY LECTURE SYLLABUS

Week	Topics	Readings
WEATHER		
Jan. 27	Introduction, Climate Science, Scientific Method Statistics, The Atmosphere: Structure	Rud: 1 Hess: 1, 3
Feb. 3	The Atmosphere: Structure, Heat and Energy Transfer, Wind	Hess: 3, 4, 5
10	The Atmosphere: Wind, Moisture	Hess: 5, 6
CLIMATE AND CLIMATE CHANGE		
17	The Atmosphere: Moisture, Fronts	Hess: 6, 7
EXAM #1 Monday, February 24th		
24	Earth's Climate System Today, Climate Archives, Data, and Models, Climate Change	Rud: 2, 3 Hess: 8
March 2	Climate Archives, Data, and Models; CO ₂ and Long-term Climate	Rud: 3, 4
9	Geologic Time, Plate Tectonics, and Long-Term Climate; Greenhouse Climate	Rud: 5, 6
16	Greenhouse Climate; Greenhouse to Icehouse: Last 50 Million Years	Rud: 6, 7
EXAM #2 Wednesday, March 18th		
<i>SPRING BREAK March 21-29th</i>		
30	Greenhouse to Icehouse: Last 50 Million Years; Astronomical Control of Solar Radiation	Rud: 7, 8
April 6	Astronomical Control of Solar Radiation; Insolation and Monsoons; Insolation and Ice Sheets	Rud: 8, 9, 10
13	Insolation and Ice Sheets; Last Glacial Maximum	Rud: 10, 13
20	Climate During and Since the Last Deglaciation; Millennial Oscillations of Climate	Rud: 14, 15

EXAM #3 Friday, April 24th

April 27 Humans and Preindustrial Climate; Climate Changes During Rud: 16, 17, 18
The Last 1,000 years; Climatic Changes Since 1850

May 4 Causes of Warming in the Last 125 Years; Future Climate Rud: 19, 20
Change and Solutions

Last Day of Class: Thursday, May 7th

Final Exam: Thursday, May 14th, 8:30-11:30 am

Professor Jim Mills

Dept. of Geosciences

Spring, 2020

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	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-9:00					
9:00-10:00					
10:00-11:00	GEOS 117 10:20-11:20		GEOS 117 10:20-11:20		GEOS 117 10:20-11:20
11:00-12:00					
12:00-1:00					
1:00-2:00					
2:00-3:00	Office Hour 1:30-2:30		Office Hour 1:30-2:30		Office Hour 1:30-2:30
3:00 – 4:00					
4:00 - 5:00	Faculty				
5:00 - 6:00	Meeting				
6:00 – 7:00					
7:00 – 8:30					
8:30 – 9:00					

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