

GEOS 117: Weather, Climate, and Climate Change

MWF 12:30-1:30, JSC 223

Professor: Dr. Tim Cope
email: tcope@depauw.edu
Office Hours: Use Tim's calendar
(link on Moodle) to make an appointment

Required Text

The Atmosphere: An Introduction to Meteorology, 14th Edition, by F. K. Lutgens, E. J. Tarbuck, and D. G. Tasa

COURSE OVERVIEW

This course is about the Earth's atmosphere, how it works, and how it changes through time. The importance of this topic cannot be overstated: Earth's atmosphere enables life as we know it to exist on the planet, so understanding how the atmosphere works, and how it interacts with other aspects of the Earth system, is vital to our well-being. It is a critically important topic today, because the changes humankind is making to our atmosphere may have dire consequences for our well-being in the near future.

Weather, climate, and climate change are deeply intertwined. They are somewhat different beasts, however. Whereas weather is the short-term variability associated with rapid changes in atmospheric conditions, climate is the long-term average state of the atmosphere in space and time. In this class, we will be exploring aspects of both weather and climate simultaneously, culminating with an examination of global climate change. We will begin by exploring the governing physical principles of weather and climate. Once we understand these basic governing principles, we can apply them to the atmosphere.

Rigorous study of weather and climate necessarily involves a lot of physics and a lot of math. My goal for this course is to avoid a rigorous quantitative treatment of the subject in favor of a more conceptual approach—it is unlikely that many of you are planning to become professional meteorologists! The study of weather and climate science also involves a fair amount of terminology, most of which will be new to you. You will need to learn the language of atmospheric science in order to understand it, so be prepared to spend some time improving your science vocabulary.

Regardless of your academic or professional interests, I think you'll find that the basic physical principles you learn in this class are useful to your everyday life beyond just weather and climate. Study of the atmosphere, like any science, is full of transferable knowledge!

COURSE GOALS

By the end of this course, you should be able to:

- Understand weather and climate data and use them to make basic predictions.
- Explain how changes in the physical state of the atmosphere produce weather.
- Recognize various forms of evidence for climate change through Earth history.
- Describe the causes of past, present, and future climate change.
- Read, interpret, create, and analyze scientific maps and diagrams.
- See the Earth as a complex physical, chemical, and biological system.

These specific learning goals, together with the general nature of the activities in this class, tie to several important University learning goals for general education courses:

Appreciate varied disciplinary and interdisciplinary methods for acquiring knowledge and demonstrate the ability to synthesize knowledge from multiple disciplines.

Identify and solve well-defined and ill-defined problems both collaboratively and individually, and apply these skills to problems facing humanity.

Demonstrate knowledge of technology and its implications in society and be able to leverage technology, where appropriate, for creative activities or innovative solutions to problems.

Demonstrate competency with varied forms of data analysis including organizing, interpreting, and drawing conclusions from quantitative and qualitative information.

STRUCTURE OF THE COURSE

Reading assignments and class time

There is a large amount of material to be covered in this class, and we will be moving through it very quickly. It is extremely important that you both attend class sessions and complete the assigned reading on time. However, simply reading the textbook and coming to class is not enough. You must ensure that you both *understand* and *retain* the information you are learning about. You can do this by:

- Taking thoughtful notes in class, preferably with carefully drawn sketches.
- Rewriting your notes while they are still fresh in your mind, to organize what you have learned.
- Taking thoughtful notes on the reading. Reading each chapter at least twice.
- Paying close attention to the illustrations in my lectures and in the book.
- Engaging with the material during class. Thinking about it outside of class.
- Participating in discussions and problem-solving.
- Asking questions and meeting with me if you are confused about anything.

Exams

There are two midterms and a final exam in this course. Collectively, these are worth 70% of your grade. Exams will cover material from both class sessions and from the reading, with emphasis on the topics covered during class. The final exam will be comprehensive (but focused mainly on material not covered in prior exams).

Projects

There are two short projects you will complete in this course. Each will involve a series of maps/charts and a brief written report. They will be graded on presentation, completeness, and accuracy. Hand in a quality product, and you will get a good grade.

Homework

I will assign homework problem sets periodically to make sure you are keeping up with the class content. These will be delivered on Moodle to be completed outside of class.

GRADING:

Grades will be assigned as follows.

Grading scale:

One-hour exams (2):	40%	A 93-100%	C 76-74%
Final Exam (Cumulative):	30%	A- 92-90%	C- 73-70%
Projects (2):	20%	B+ 89-87%	D+69-67%
Homework:	10%	B 86-84%	D 66-64%
		B- 83-80%	D- 63-60%
		C+ 79-77%	F <60%

GENERAL POLICIES

Inclusivity Statement:

It is the policy and practice of this course to create a welcoming environment for all students and to address students in accordance with their personal identity. In this course, you will be encouraged to remain open to information, ideas, and experiences shared by other students.

Academic Integrity Policy

Cheating, plagiarism, submission of the work of others, etc. violates DePauw's policy on academic integrity and may result in penalties ranging from a lowered grade to course failure, suspension, or expulsion. The policy and discussion of each student's obligations and rights can be found in the Student Handbook. The policy is also available [here](#). If you have any questions about my expectations regarding academic integrity, including my expectations regarding group work, it is your responsibility to ask me.

Accommodations for those with disabilities

It is the policy and practice of DePauw University to strive to support the student experience and to provide reasonable accommodations for students with properly documented disabilities. If you are eligible to receive an accommodation and would like to request it for this course, please contact student disability services. Allow one-week advance notice to ensure enough time for reasonable accommodations to be made. 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 visit [student accessibility services](#) to schedule an appointment.

Religious Holy Days

DePauw University embraces the religious diversity of its students. 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 activities required by normal class participation are prohibited by a religious tradition, or a special worship obligation is required by a religious tradition. ("Religious Holy Days," Section VII, Academic Policies, Academic Handbook)

Students with questions should contact Maureen Knudsen Langdoc, University Chaplain and Associate Dean or Jonathan Martin, Associate Chaplain and Director of the Center for Spiritual Life (spirituallife@depauw.edu; 765-658-6768).

Student Title IX Policy

DePauw University affirms its commitment to fairness and equity in all aspects of the educational experience. Harassment and discrimination based on gender or sexuality—including sexual harassment, sexual assault, dating violence, domestic violence, stalking, and Title IX retaliation—prevent students from accessing an equal education and violate university policy as well as the law. Find full information at www.depauw.edu/titleix. If you or someone you know experience behavior that is coercive, discriminatory, harassing, or sexually violent, you are encouraged to contact our Title IX Administrators, Rhyen Smith, JD or Dionne Jackson, Ed.D. at titleixcoordinator@depauw.edu or 765-658-4155.

COURSE SCHEDULE

Here is a general schedule for the class that we will try to follow. Changes to the schedule may be made as needed during the semester. Any changes will be announced ahead of time.

Week of:	Topic	Reading	Additional (Mondays)
Jan 29	Introduction to the atmosphere	Chapter 1	
Feb 5	Atmospheric heating and energy transfer	Chapter 2	Project #1: Taking Earth's temperature
Feb 12	Temperature	Chapter 3	Project # 1 data due
Feb 19	Water vapor	Chapter 4	Project #1 analysis due
Feb 26	Condensation and precipitation	Chapter 5	Project #1 write up due
Mar 4	Pressure and Wind	Chapter 6	Exam #1: Monday, Mar 4
Mar 11	Atmospheric circulation	Chapter 7	
Mar 18	Air Masses	Chapter 8	
Spring Break: March 22-31			
Apr 1	Mid-latitude cyclones	Chapter 9	
Apr 8	Thunderstorms	Chapter 10	Eclipse! April 8
Apr 15	Hurricanes	Chapter 11	Exam #2: Monday, Apr. 15
Apr 22	Air pollution	Chapter 12, 13	Project #2: Climate forecasting
Apr 29	Climate change	Chapter 14	
May 6	World climates	Chapter 15	Project #2 due

Final Exam: Thursday, May 16, 8:30-11:30 AM