

GEOS 117: Weather, Climate, and Climate Change

MWF 2:50-3:50, JSC 223

Professor: Dr. Tim Cope

email: tcope@depauw.edu

Office Hours: Use my 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

Other readings as assigned.

COURSE OVERVIEW

This course is about the Earth's atmosphere: how it works, how it interacts with other parts of the Earth system, 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 it works is vital to our well-being. It is a timely topic, because the changes humankind is making to our atmosphere today may have dire consequences for our well-being in the near future.

Weather and climate are deeply intertwined. They are somewhat different beasts, however. Weather is the short-term variability associated with rapid changes in atmospheric conditions, whereas climate is averaged over many years. 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 physical principles that govern the behavior of our atmosphere (and many other things, like your refrigerator). Once we understand these basic governing principles, we will be better equipped to understand weather and climate phenomena.

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 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 the interpretation of climate data and a brief written report. They will be graded on presentation, completeness, and accuracy. Hand in a complete, 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 for you to complete outside of class.

GRADING:

Grades will be assigned as follows.

One-hour exams (2):	40%
Final Exam (Cumulative):	30%
Projects (2):	20%
Homework:	10%

Grading scale:

A	93-100%	C	76-74%
A-	92-90%	C-	73-70%
B+	89-87%	D+	69-67%
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.

Any use of AI in this class will be treated just like assistance from another person. Assistance of any kind is prohibited on items meant to assess individual learning, such as exams and quizzes. Likewise, it circumvents the learning goals of this class—and it is plagiarism—to turn in written work generated by AI in place of your own.

Accommodations for those with disabilities

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 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 in Union Building Suite 208 or by phone at 658-6267.

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). [Center for Spiritual Life](#).

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, Rhyan 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)
Aug 21	Introduction to the atmosphere	Chapter 1	
Aug 26	Heating and energy transfer	Chapter 2	Project #1 introduction
Sept 4	Earth's energy balance	Chapter 2	Project #1 Part 1 due
Sept 9	Temperature	Chapter 3	Project #1 Part 2 due
Sept 16	Atmospheric stability	Chapter 4	Project #1 Part 3 due
Sept 23	Condensation and precipitation	Chapter 5	Exam #1: Monday, Sept 23
Sept 30	Pressure and Wind	Chapter 6	Project #1 Part 4 due
Oct 7	Atmospheric circulation	Chapter 7	Project #1 paper due
Fall Break: Oct 12-20			
Oct 21	Mid-Latitude cyclones	Chapter 8 & 9	Project #2 intro
Oct 28	Thunderstorms	Chapter 10	Project #2 Part 1 due
Nov 4	Hurricanes	Chapter 11	Exam #2: Monday, Nov. 4
Nov 11	Air Pollution	Chapter 13	Project #2 Part 2 due
Nov 18	Earth's changing climate	Chapter 14	Project #2 Part 3 due
Nov 25	Global Climate	Chapter 15	Thanksgiving Break
Thanksgiving Break: Nov 27 – Dec 1			
Dec 2	Modern climate change		Project #2 Analysis due

Final Exam: Wednesday, December 11, 1:00-4:00 PM