EVAT 5300: Introduction to Climatology (3 credits)
Fall 2022
Lecture: MWF 11:00 a.m. – 11:50 a.m. (Clark Hall Room 101)

Instructor

Kevin Grise
Office: 380B Clark Hall
Email: kmg3r@virginia.edu
Phone: (434) 924-0433

Office Hours

TBD, or by appointment

Office hours will be held in the 380 Clark Hall conference room. Upon request, a Zoom option is also available (see link under Online Meetings tab on Collab).

Course Description

This class provides a graduate-level introduction to the physical laws governing Earth's climate system. In this class, we'll cover foundational knowledge about atmospheric radiative transfer, the general circulation of the atmosphere and ocean, and climate variability and change. The class will also introduce you to a number of climate data sets, which can be used for a variety of research purposes.

At the end of this course, you will be able to:

- Describe in detail how Earth's greenhouse effect works
- Explain climatological patterns of winds, weather systems, and ocean currents
- Understand modes of climate variability, such as the El Niño-Southern Oscillation
- Discuss what is certain and uncertain about 21st century climate change
- Apply climate data sets to research problems in environmental sciences

This course provides fundamental knowledge of atmospheric science and climate that is appropriate for graduate students specializing in all areas of environmental sciences.

Who Should Take This Class?

- All graduate students in environmental sciences!
- Upper-level undergraduate students who are considering graduate school or a career in an atmospheric science or climate related field

Prerequisites

- For graduate students, contrary to what SIS says, no prior knowledge of atmospheric science is required.
- For undergraduate students, EVSC 3300 (Atmosphere and Weather)

Course Outline

- Introduction to Earth's Climate System
- Atmospheric Radiative Transfer and Planetary Energy Balance
- Surface Energy Balance
- Atmosphere's General Circulation
- Ocean's General Circulation
- Modes of Climate Variability
- Climate Feedbacks and Climate Change

A detailed course outline is provided under the Schedule tab on the course Collab website. Please check the outline regularly as it will be updated throughout the semester with readings, lecture notes, and assignments.

Textbooks

There is no required textbook for this class. A recommended textbook is:

- *Global Physical Climatology*, 2nd Edition, by Dennis L. Hartmann, 2016

I will be following Hartmann's textbook closely throughout the semester, but the book is not required, as the level of physics and math in the book is intended for atmospheric science graduate students and is therefore not appropriate for all students enrolled in this class.

Other Useful References

For students without any background in atmospheric science, a good reference is the book we use in our undergraduate EVSC 3300 (Atmosphere and Weather) class:

- *Meteorology Today: An Introduction to Weather, Climate, and the Environment,* by C. Donald Ahrens, Brooks/Cole, Any Edition

For students wanting a deeper background in atmospheric science, consider also:

- *Atmospheric Science: An Introductory Survey* by John M. Wallace and Peter V. Hobbs, Academic Press, 2006 (Second Edition)

Assessment and Evaluation

Quizzes (10%)
Homework (25%)
Exams (30%)
Research Project (35%)

Quizzes: As an incentive for keeping up with the course lectures, there will be a five-question weekly online quiz (open book, open notes, etc.) due most Fridays by 5 p.m. (see detailed schedule on Collab). No quiz will be given during the first week of class or during the weeks of the two exams. The quizzes will be multiple choice or short answer and administered through the Test and Quizzes tab on Collab. You will receive 50% credit for completing each quiz and an additional 10% for each correct answer. **The lowest quiz grade for the semester will be dropped!**

Homework: Four homework assignments will be assigned throughout the semester. Assignments and due dates will be posted to the Collab website and announced in class, and assignments can be turned in via the Assignments tab on Collab. The homework assignments will provide practice for the types of quantitative and longer-answer questions that can be expected on exams, and will also introduce you to data analysis skills that will be helpful for your final project (and also in your future research!). Students are encouraged to work together on the homework assignments, but must turn in their own solutions. Copying of another student's solutions is a violation of the Honor Code.

Exams: Two midterm exams will be given on Friday October 7 and Friday November 18. Each exam will be worth 15% of the final course grade. No final exam will be given. The exams will primarily be quantitative problem solving and essay-type questions. Exams may also include some short answer questions. Students who miss exams without prior approval of the instructor will receive a zero on the exam.

Research Project: You will be required to complete a short research project that incorporates your knowledge of atmospheric science and climate from this semester. Ideally, this will be related to your personal research interests, and for graduate students, I would encourage you to discuss this project with your advisor. This project is not a paper that is a literature review of a specific topic, but you will be required to gather and analyze data on a research question of your choosing.

To get your project off to a fast start, I will be meeting with each of you individually early in the semester to help you select a topic. Then, you will prepare a short proposal and a complete literature review with a bibliography. This will be due on Friday October 21 and will count for 10% of your course grade.

The remaining part of your research project will be the preparation of a journal-style manuscript that summarizes your research findings. This is due on the last day of class (Monday December 5) and is worth 25% of your course grade. You are not permitted to use a project that you may have already prepared for a previous course … this must largely be original work done for this course during this semester.

During the last week of class, students will be expected to present a 10-minute conference-style presentation summarizing their results to classmates. The quality of the presentation will factor into your final grade for the research project.

Detailed guidelines for both the proposal and the paper are posted in the Final Project folder under the Resources tab on Collab.

Grading Scale

A+: 99-100	A: 93-98	A-: 90-92
B+: 87-89	B: 83-86	B-: 80-82
C+: 77-79	C: 73-76	C-: 70-72
D+: 67-69	D: 63-66	D-: 60-62

F: Less than 60

Questions??

Class participation and asking questions in class is strongly encouraged. Questions outside of class can be addressed to the instructor during office hours or via email. Please schedule an appointment to meet with the instructor outside of office hours.

COVID Policy

To keep everyone safe and healthy this semester, please follow all university directives (masking, quarantine, etc.) regarding the ongoing pandemic. Lecture recordings will be made available for those who are unable to attend class in person.