



Evan Couzo, PhD

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231 Rhoades Robinson Hall (sometimes 115 Zageir Hall)

Office Hours: TW – 11:30 a.m. to 1:00 p.m. or by appointment

828.251.6026 (but I don't answer)

Course Description: This course will examine the Earth's climate from a physical perspective. We will explore the individual systems that make up the climate system and connect each of them to the whole. We will also discuss the science of climate change, including a look at some of the computer models that predict it, evidence of its existence, and uncertainties.

Prerequisite: ATMS 103 or 113

Credit Hours: 3

Class Meetings: TR – 9:55 to 11:10 a.m. – 238 Rhoades Robinson Hall

Online Course Site: classroom.google.com, Class Code: q4e7q6e

Required Texts

1. K. Cook (2013). *Climate Dynamics*. Princeton, NJ: Princeton University Press. ISBN: 978-0-691-12530-5.
2. Other assigned readings will correspond to weekly topics. These readings will be accessible online via Google Classroom.

Covid Health Requirements: In-person instruction during this active pandemic is inherently risky, though the university has created policies to mitigate some of those risks. See <https://coronavirus.unca.edu/> for details paying close attention to Community Expectations (<https://coronavirus.unca.edu/return-to-campus/community-expectations/>). Note that while the university uses positive framing to describe our policy, these *expectations* are, in fact, *requirements*. At a minimum, you must adhere to the following protective measures.

- Everyone must wear cloth masks at all times in public spaces. Note that not all masks provide equal protection. To work properly, masks must be made of tightly woven material and fit closely over your mouth and nose.

E. Fischer et al. Low-cost measurement of facemask efficacy for filtering expelled droplets during speech. *Sci. Adv.*, August 7, 2020. doi:10.1126/sciadv.abd3083

- Everyone will maintain impeccable personal hygiene including coughing/sneezing into your elbow (even when wearing a mask) and following CDC standards for hand-washing.
- No one will come to class with Covid-like symptoms.
- No one will come to class if they were in close contact with someone infected - or suspected to be infected - with the SARS-CoV-2 virus.
- Covid-related absences will be excused, but prompt notice is required.

These requirements are subject to change as we learn more about Covid-19 transmission and break-through infections. I reserve the right to require measures that are more strict than those implemented by the university.

Assignments

1. Problem Sets (40%): There will be four problem sets throughout the semester. You are allowed to work together on these, but the work you turn in to me must be your own. Problem sets will usually be more challenging than exams and may require you to consult external sources (i.e., other than the textbook and lecture notes). Problem sets are due at the beginning of class on the days indicated in the **Course Calendar** section below. Late problem sets turned in up to 24 hours after the due date/time will incur a 25% penalty; I may not accept work more than 24 hours overdue.
2. Exams (45%): You will have a total of three exams each worth 15% of your final grade. Two exams will take place during the semester. These midterm exams will focus on new material. The final exam is comprehensive, but will skew towards new material. Exams are closed-book and closed-notes, but I will provide a sheet with relevant equations. Barring extraordinary circumstances, make up exams are not allowed.
3. Climate Modeling Project(15%): You will experiment with a low-complexity Earth System Model. In this project, you will design a climate scenario, run the model, analyze the simulation results, and detail your findings in a written report and in-class presentation. More details will be given in class.

Grading Policy

	B+	88-89	C+	78-79	D+	68-69	F	<60
A	92-100	B	82-87	C	72-77	D	62-67	
A-	90-91	B-	80-81	C-	70-71	D-	60-61	

Expectations

1. Attendance: Attendance and active class participation are expected. You are allowed two absences during the semester without penalty if prior notice is given. Students are responsible for any and all class information whether or not they were present when the information was provided. Active engagement during this type of seminar class is critical. Note that more than seven unexcused absences will result in automatic failure.

2. Readings: All readings are to be done before class on the day that reading will be discussed. The assigned readings are specified in the **Course Calendar** below.

3. Electronics: All electronics (cell phones, laptops, tablets, etc.) must be silenced and put away during class. If you need to make an emergency call, you are welcome to leave the classroom. I encourage you to take notes on paper – it actually helps you learn better that way. See <https://www.sciencedaily.com/releases/2014/04/140424102837.htm> for a summary of the article cited below.

P. Mueller and D. Oppenheimer (2014). The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking. *Psychological Science*, 25(6), pp. 1159-1168. doi.org/10.1177/0956797614524581

If you have a special requirement for electronic use during class, please see me and/or make arrangements through the Office of Academic Accessibility (<https://oaa.unca.edu/>).

Course Calendar

Week 1

Aug 17 first day stuff

Aug 19 The Atmosphere – Cook pp. 5-22

Week 2

Aug 24 The Ocean – Cook pp.22-33

Aug 26 The Hydrological Cycle – Cook pp. 33-42

Problem Set 1

Week 3

Aug 31 The Cryosphere and Biosphere – Cook pp. 42-47

Sep 2 Natural Climate Variability – Cook pp. 49-63

Week 4

Sep 7 Natural Climate Variability – Cook pp. 49-65

Sep 9 **Exam 1**

Week 5

Sep 14 Radiative Processes – Cook pp.66-82, 85-87

Sep 16 NO CLASS - Yom Kippur

Week 6

Sep 21 Radiative Processes – Cook pp.66-82, 85-87 **Problem Set 2**

Sep 23 Thermodynamics and Heat Flow – Cook pp. 98-107

Week 7

Sep 28 Thermodynamics and Heat Flow – Cook pp. 98-107

Sep 30 Paleoclimatology **Problem Set 3**

Week 8

Oct 5 NO CLASS - Fall Break

Oct 7 Snowball Earth

Week 9

Oct 12 Atmospheric Circulation – Cook pp. 126-134

Oct 14 **Exam 2**

Week 10

Oct 19 The Coriolis Force

Oct 21 Radiative Forcing – Cook pp. 153-163

Week 11

Oct 26 Radiative Forcing – Cook pp. 153-163

Oct 28 Climate Sensitivity and Feedbacks – Cook pp. 165-172

Week 12

Nov 2 Climate Sensitivity and Feedbacks – Cook pp. 165-172

Nov 4 Climate Modeling – Cook pp.174-186 **Problem Set 4**

Week 13

Nov 9 modeling project

Nov 11 modeling project

Week 14

Nov 16 presentations

**Climate Model-
ing Report**Nov 18 CO₂ Saturation

Week 15

Nov 23 NO CLASS - Undergraduate Research Day

Nov 25 NO CLASS - Thanksgiving Break

Week 16Nov 30 The Climate Penalty – Jacob and Winner (“Effect of Climate on Air Quality”)

Final Exam Tuesday, Dec 7, 8:00-10:30 a.m.

Student Learning Outcomes: UNC Asheville and the Department of Atmospheric Sciences have developed a number of learning outcomes, or ideas and abilities that we believe you should have when you leave here. This course addresses several of these outcomes, which can be accessed on our department website at <http://www.atms.unca.edu/slos.shtml>.

Accommodations for Students with Disabilities: University of North Carolina at Asheville is committed to making courses, programs and activities accessible to persons with documented disabilities. Students requesting accommodations and/or academic adjustments must do so through the Office of Academic Accessibility and may be required to provide supporting documentation. All information provided will remain confidential. For more information please contact the Office of Academic Accessibility at 828.232.5050 or academicaccess@unca.edu, visit them in the OneStop Student Services Center or at their website <https://oaa.unca.edu/>.

University Academic Policies and Procedures: Students are expected to abide by UNC Asheville academic policies and procedures, especially those regarding academic honesty and in-class behavior. They can be summarized as don't cheat and come to learn. See <http://catalog.unca.edu/> for the exact wording of the policy.