

EVSC 3300—Atmosphere and Weather

Fall, 2020
107 Clark Hall

Robert E. Davis

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Office Hours:

Monday, 1:30 p.m.–3:00 p.m. (Zoom only)
Wednesday, 11:00 a.m.–Noon (in-person, walk-in)
By appointment (if above times don't work)

COURSE OUTLINE

Required Text:

Understanding Our Atmospheric Environment by Neiburger, Edinger, and Bonner
(Second Edition). (Free on-line on class website.)

Recommended Text:

Meteorology Today by C. Donald Ahrens, Brooks/Cole. (Any edition will suffice).

Other Useful Atmospheric Sciences References:

Meteorology for Scientists and Engineers by Ronald B. Stull.

Meteorology by Danielson, E.W., Levin, J. and E. Abrams, McGraw-Hill.

These textbooks, and many others, are available in the library in Clark Hall.

Course Delivery

This class is being taught synchronously and (hopefully) in-person after September 8. Most of you who wish to attend class in person will be able to do so, based on the room's capacity. The lectures will be also broadcast live for those students who are unable or unwilling to attend class in-person, but the class delivery will still be synchronous. Details regarding in-person class attendance will be provided in early September. The recording and/or distribution of lectures without permission is prohibited and considered an honor violation.

Grading:

This course is divided into three fundamental areas: radiation, thermodynamics, and atmospheric fluid dynamics. There will be three examinations that will approximately coincide with each area. All three examinations will be given during regular class periods with the last exam on the last day of class. There will be no cumulative final examination. The exams will consist of a variety of questions: essay-type questions and objective-type multiple choice and short answer questions. The exam questions will be based almost entirely on the material presented in class; therefore, class attendance is essential if you are to obtain the information necessary for the exams.

Honor Policy: Given the availability of old exams, worked problem sets, and laboratory exercises that are increasingly becoming available from online services and other venues, the Environmental Sciences Department considers student access of these materials for Environmental Sciences courses, without explicit instructor permission, to be a violation of the UVa Honor Code.

Your grade will be based on the total points you receive on three exams, each of which accounts for 24% of your grade, your points from three problem sets (one for each section of the course) that will account for 24% of your course grade (so each problem set is worth 8%), and your answers to Learning Catalytics questions posed during lectures (4% of your total grade, details will follow). Your letter grade on each exam should only be used as a guide to your current standing in the class—your point total is the sole criterion used in determining your final grade. The final grades will be curved in your favor if a curve is warranted. *Extra credit is not available to anyone in this course under any circumstance (except via the weather forecasting contest—details later in the semester).*

The following is the examination schedule for this semester:

Exam #1	Wednesday, September 23
Exam #2	Friday, October 23
Exam #3	Monday, November 23

If you have any conflicts (officially sanctioned University academic or athletic activities) with the examination dates, I need to have that information soon so alternative arrangements can be discussed with you and your coach/advisor. If you miss any of the exams without prior approval from me, you will receive a zero on the exam. *No make-up exams will be given.*

[THE EXAM SCHEDULE: I will not change the exam dates based upon our pace in the class, so please put these dates on your social/academic calendars and plan your activities accordingly. Conflicts with work/exams in other classes is no excuse. Plan your study schedule with these dates in mind.]

Website:

Almost all of the information related to this class will be posted on the class webpage. The address is:

<https://climate.evsc.virginia.edu/evsc-3300-home/>

Please bookmark it. The Powerpoint presentations that I use in lectures, along with all of the websites that I access, can all be found on this webpage. (Also note that another course, EVSC 1300, has a link on the top right of the website, so be sure you have linked to the correct class.)

Learning Catalytics

This semester, I will be using in-class questions via the Learning Catalytics tool to query your understanding of topics we are covering during lecture. You can access these questions via the Learning Catalytics website (learningcatalytics.com) on a computer, tablet, or smart phone, and your responses are updated simultaneously and recorded. You need to sign up for this service and pay a fairly nominal fee for the semester. This is a required part of the class. You will receive 2 points for each correct answer, 1 point for an incorrect answer, and no points for not participating. Your semester totals will be scaled at the end of the semester to account for up to 4% of your overall course grade.

Labs:

Environmental Sciences majors are *required* to enroll in one of the five lab sections (EVSC 3301) associated with the class. The Tuesday, Wednesday, and Thursday sections will meet in-person in Clark G004; the other two lab sections will be asynchronous. Although your lab grade is separate from your course grade, information will be presented in the labs that is related to the lectures. Therefore, poor attendance or performance in the lab can adversely affect your course grade. Complete details of the lab requirements and lab grading policies will be outlined in your first lab session. Labs will begin the week of August 31 (on-line) and will be in-person for those enrolled in those sections starting on September 8.

Graduate Teaching Assistants:

Six teaching assistants are assigned to this course who are responsible for teaching and grading the labs, assisting in grading the problem sets, and helping you with any questions you have throughout the semester. Their office hours will be distributed with the lab syllabus during the first lab meeting and will be posted on the class web page. One of the T.A.s is specifically assigned to help with the lecture portion of the course, and this T.A. will be present for all of the lectures and will play in key role in supporting the live on-line broadcasts of the in-person lectures.

Weather Forecasting Contest:

For approximately the last half of the semester, we will have a weather forecasting contest in which all class members will make daily weather forecasts. The winners of this contest will receive a significant bonus in their course grade. Those who do not do as well will not be penalized. More details will be provided later in the semester.

VARIOUS AND SUNDRY

E-mail

E-mail will be the main way that I'll be communicating with you about the class, so please check it regularly for potential announcements, corrections, etc. I realize that some of you are not regular email users. Make checking email to be part of your daily routine. Also, feel free to contact me with simple questions as they arise. I'm not at all trying to discourage office visits, but often you might have a fairly straightforward question that can be easily handled via email.

(<https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-beingannoying-af-cf64ae0e4087#.sroi79ro7>)

Teaching Assistants and Labs

Your T.A.s are generally capable of answering questions on the lectures as well as the labs. Please use them as a resource but don't abuse them. They have their own classes, projects, and research responsibilities in addition to teaching this class. Try to abide by their office hours as much as possible or make arrangements to meet them in advance rather than "popping by" their offices. Don't feel that you may only meet with the T.A. for your section.

We do the best we can to coordinate the labs and lectures, but a perfect correspondence is not possible with this course. I will not generally be able to answer specific questions on the lab exercises—seek out your T.A.s for advice on the labs.

Irritants

Each of us has pet peeves. To be fair to you, I want to let you know mine at the outset. Don't come to class to sleep, post on social media, text your friends, etc. I will not hesitate to throw you out. This semester, seats to attend live lectures have become a precious commodity. If you are assigned to come to class and you are not sick, please be sure to attend. You are literally potentially taking the seat of another student who wishes to attend but cannot do so because of space restriction. But even worse is coming to class when you are sick. A little personal responsibility will go a long way in getting us past this mess.

How to Do Well

I welcome questions during (and after) my lectures. For everyone who asks a question, there are three others silently thanking them.

The best thing you can do to excel in this course, aside from perfect attendance (in mind and body), is to continuously review your notes. A half-hour time investment a few days per week will do wonders when the time comes to begin studying in earnest. If you have questions, please don't wait until the week (or the day) before the exam—that's too late. One of the beauties of this course is how it builds on previous knowledge. Loose ends are continuously tied along the way. The danger is that if you don't really understand radiation (the first section), you may very well have problems when you get to dynamics. It's very important that you keep up with the lectures.

READING ASSIGNMENTS

Reading assignments will not be made in class, so you will be expected to keep up with the assigned readings on your own. I will provide page or chapter numbers on the slides so you can cross-reference each lecture with the book topics.

The purpose of this course is to provide a general overview of atmospheric sciences for environmental sciences majors. As such, this is not a typical junior-level meteorology course that you would find in many meteorology departments. We will focus on the basic physical principles and processes that are responsible for the observed behavior of the atmosphere. Wherever possible, the linkages of weather and climate to ecology, hydrology, geosciences, and atmospheric chemistry will be explored. (Key: N= Neiburger; A=Ahrens (11th edition))

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|----|---|--------------------|
| I. | ATMOSPHERIC COMPOSITION AND ENERGY | N: Chapters 2, 3 |
| | A. Atmospheric composition | A: Chapters 1–3, 8 |
| | B. Atmospheric structure | pp. 198–210 |
| | C. Electromagnetic spectrum | |
| | D. Radiation laws | |
| | E. Earth/Sun geometry—seasonal and diurnal disposition of radiation | |
| | F. Earth’s energy balance—solar and terrestrial radiation | |
| | G. Global distribution of energy | |

(Exam 1, Sept. 23, 24%, based on section I)

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| II. | THERMODYNAMICS | N: Chapters 4–5, 1 |
| | A. Ideal gas law (equation of state) | A: Chapters 5–7 |
| | B. Hydrostatic atmosphere | |
| | C. First Law of Thermodynamics (heat, work, and temperature change) | |
| | D. Dry air thermodynamics | |
| | E. Stability and the “parcel method” | |
| | F. Moisture variables and humidity | |
| | G. Condensation | |
| | H. Fog formation | |
| | I. Phase changes of water, latent heat | |
| | J. Moist air thermodynamics | |
| | K. Precipitation formation | |
| | L. Cloud formation | |
| | M. Cloud classification | |
| | N. Global precipitation | |
| | O. Hydrologic cycle | |
| | P. Evaporation, transpiration, and the climatic water budget | |

(Exam 2, Oct. 23, 24%, based on section II)

III. ATMOSPHERIC FLUID DYNAMICS

N: Chapters 7–12

A. Fundamentals: forces and winds

A: Chaps. 8–12, 16

1. Forces and their balance, Newton's Second Law
2. Equations of motion
3. Vertical motion, divergence, and vorticity

B. Large-scale dynamics and the general circulation of the atmosphere

1. Global-scale circulation
2. Mid-latitudes: air masses, fronts, cyclones, and anticyclones, frontal weather, upper-air circulation and the jet streams
3. Tropical weather: tropical cyclones, monsoons

(Exam 3, Nov. 23, 24%, based on section III)

The material we cover is subject to change considering that this semester is abbreviated. I will let you know when and if we skip sections. Regardless of our pace, on the exams, you will only be responsible for the topics we covered in lecture.