

Syllabus: EART 121 *The Atmosphere* Fall 2019

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Course Information

Class Website: available on Canvas

Class Meeting Times: MWF 12.00 to 13.05 in Earth and Marine Sciences Room D258

Discussion Section: Mon 16.00 to 17.30, also in Earth and Marine Sciences Room D258

Section Policy: Attendance in the section is mandatory. If you miss more than one without a valid reason, you will lose 1% off your final grade per section missed.

Supplemental material: Will be provided through the course website. I will provide the supplementary material as required. Unless otherwise noted, all handouts are to be considered part of the core material.

Missed Classes: If you miss a class, you should get the notes from a fellow student. My own notes just wouldn't make any sense to you.

Exams: Midterm exam will be scheduled at a later date. The final exam is set by UCSC policy for Tues Dec 10 from 08.00 to 11.00.

Course Outline

In this course, we will learn about the atmospheric phenomena that are important to our everyday lives – clouds, precipitation, storms, hurricanes, lightning, tornadoes, ozone hole, greenhouse effect, air pollution – now and in the future. To do so, we will first examine some of the more fundamental concepts that are common among many of these phenomena, such as atmospheric moisture, temperature, winds, and sunlight, after which we will examine elements of weather and climate. Topics to be covered include:

- Basics of the atmosphere and the sun
- Greenhouse effect, carbon cycle, aerosol effects on climate, climate change
- Water, clouds, and precipitation
- Winds, atmospheric circulation and weather patterns
- Air masses, fronts, and cyclones
- Severe weather: tornadoes, hurricanes, lightning, and thunder
- Atmospheric chemistry, stratospheric ozone depletion, urban air pollution

Evaluation

** Homework: 40% ** Midterm quiz: 20% ** Final exam: 40% **

Homework sets: These will be comprised mainly of quantitative problems. There will be approximately 8 problem sets during the quarter. **Homework sets will be due at 5 PM on Fridays.** Unless previous arrangements are made, homework sets turned in by 5 PM on Monday are worth 50%; homework sets will not be accepted after that. You can hand them in to me during class or in the box outside my office. **Late homeworks must be handed to me directly.**

Homework grading: All problems will be graded on a scale of 0, 25%, 50%, 75% or 100%. This reflects the realistic certainty of grading problem sets. Note that grades are rounded to the NEAREST reasonable value, they are NOT ROUNDED DOWN. So this means that if your solution is close but not perfectly correct, you can still receive 100% for the problem. Over the course of the quarter, any small issues should be averaged out.

Exams: Exams will be made up of short answer questions (approx. 2/3 of points) and quantitative questions (approx. 1/3 of points). A list of potential short answer questions will be provided ahead of time.

Extra credit: ** There will be no extra credit offered to any individuals. No exceptions. ** I may give out extra credit work, but if I do, it will be available to all students in the class.

Grades

Grading will not necessarily be “on a curve.” There is no expectation of what the average grade should be, nor what the grade distribution should look like. If everyone were to demonstrate outstanding understanding of all the material, then everyone deserves a grade of A (and I would be very happy to give each one of them)! I therefore encourage you to discuss the course material with each other to get the most out of the class.

I will **guarantee** the following letter grades: if you get a 90% or above, you will get an A or better; 80% = B or better; 70% = C or better. The scale could slide downwards, e.g.. an A is actually 86% or better, but what I am saying is that it won't slide upwards.

Historical grades: Historically in this class, the minimum grade for an A is somewhere between 83 to 88%; for a B is about 70 to 75%; for a C is about 45 to 50%. These are simply guidelines, however, and these are always subject to change.

Adjustment of letter grade: One can receive an upward adjustment of letter grade for a number of reasons (e.g. very strong improvement during the quarter, notable participation during class, exceptional effort). In almost all cases such an adjustment will be one letter grade fraction (e.g. B to B+), except under very exceptional cases, when two letter grade fractions will be awarded. Under no circumstances will a reduction in letter grade be given, and these adjustments are made after the normal grades are assigned and therefore affect no one else's letter grade.

Course Tenets

(1) There is no required course textbook. I haven't yet found a good textbook for this course. There are lots of texts that cover this material in the Science and Engineering Library. I also have a bunch

of textbooks that you can look at in my office that you can actually borrow for short stretches - just drop by.

(2) University is about learning skills. Learning facts to accompany these skills is also necessary, but not the most important part. To learn facts, you can go to the library and read a book. It would be easier and a lot cheaper. A university-level course is both harder and more expensive because learning skills is much more challenging. However, learning a new skill also requires significant effort from the student, and this is your responsibility in this course – to make the most of this opportunity by investing the time, energy, and most importantly, thought, necessary to master something new.

(3) You will use calculus. I have found that EART 121 students generally have a good handle on how to solve problems that require algebra. However, you have all taken (and passed) calculus but many of you haven't really found much use for it. We will try to exercise these skills in this class.

Problem sets: Tips for success

1. Work together! Many studies show that working in small groups is one of the best ways to learn. Note the verb “working”, which connotes being actively involved in the process. Sitting around watching your friends work does NOT count as working!

Note: While working together on homeworks is strongly encouraged, **verbatim copying of one person's homework by another is NOT appropriate**. Thus, word answers should be written *in your own words* even if the conceptual idea is the same as somebody else's. We realize that for quantitative problems, working together may lead to identical solutions, but you should do your best to make sure each person is contributing and understands the solution. You might also notice that there's probably no way to enforce this. However, students who don't learn to do these problems on the homeworks (each homework is worth about 5% of your overall grade) will be at a strong disadvantage on the midterm and final exams, where some portion of the grade (roughly one-third) will be solving quantitative problems, which translates to about 20% of your overall grade. Thus, the time to learn the quantitative concepts is on the problem sets, not right before the final exam!

2. Think physically. Sometimes it's easy to get lost in the mechanics of the math, but you should always have in mind that you are solving a physical problem. This is especially important when you solve a problem – make sure that this solution makes sense to you given what you know about the world around you.

Problem sets: Ten Commandments

1. Thou shalt write legibly (most of you are good about this).
2. Thou shalt organize your solutions in a clear fashion. You may need to re-write your solutions so they are understandable.
3. Thou shalt try to use symbols rather than values until the latter becomes absolutely necessary.
4. Thou shalt ALWAYS have units associated with numbers. Units are NOT OPTIONAL. Numbers without units are meaningless.

5. Thou shalt use 2 to 3 significant figures on all problems, unless otherwise stated.
6. Thou shalt show your work. Do NOT skip steps. Otherwise it makes it hard or impossible for me to grade.
7. Thou shalt avoid “magic math.” Vanishing negative signs, derivatives and integral limits that pop out of thin air, etc., are to be avoided.
8. Thou shalt define variables. Writing a bunch of symbols without knowing their meaning isn't helpful. Use a diagram, for example, to show what the variables are.
9. Thou shalt use scientific notation for particularly small and large numbers.
10. **Thou shalt use common sense to evaluate all answers.** Is the sign appropriate? How about the order of magnitude? If not, you are expected to write a few sentences to say why the answer seems unrealistic.