

PHYSICAL METEOROLOGY

ATMS 455

SPRING 2008

Physical meteorology refers to the study of optical, electrical, acoustic, and thermodynamic phenomena, atmospheric composition and radiative properties, and cloud and precipitation physics. This course will visit many of these fascinating topics and you will develop a solid understanding of the physical processes influencing various atmospheric phenomena. The topics that you study here will likely provide a firm foundation for the specialized subjects that you may encounter later in your career. Ask lots of questions and have fun!



PROFESSOR

Dr. Christopher Godfrey

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Office hours: 1–2 p.m. Monday and Wednesday, 11–12 p.m. Monday, or by appointment as necessary

CLASS INFORMATION

Meeting times: TR 3:10–4:25 p.m.

Location: Karpen Hall, room 034

Required text: None.

Optional text: Wallace, J. M., and P. V. Hobbs, 1977: *Atmospheric Science: An Introductory Survey*. Academic Press, 467 pp. (First or second edition)

Prerequisite: ATMS 305: Atmospheric Thermodynamics and Statics

Website: <http://facstaff.unca.edu/cgodfrey/courses/atms455/>

GETTING QUESTIONS ANSWERED

I will be in my office during scheduled office hours, but if at any other time you have a question and my office door is open, you are more than welcome to visit. Otherwise, e-mail is the best way to reach me. You may also schedule an appointment with me. Please don't hesitate to ask questions about class, other coursework, or the stresses of college life whenever the need arises.

IMPORTANT DATES

Thursday, 21 February 2008	Exam I	In class
Thursday, 3 April 2008	Exam II	In class
Thursday, 17 April 2008	Research paper due	5:00 p.m.
Tuesday, 29 April 2008	Final Exam*	In class

*Those who are not graduating this semester may opt to take the final exam on Tuesday, 6 May 2008 from 3:00–5:30 p.m. If you plan to exercise this option, please let me know in writing (e-mail is fine) by April 3, 2008.



COURSE OUTLINE

This course outline is subject to modifications, depending on the interests of the class and available time.

1. Composition and structure of the atmosphere
 - a. Atmospheric composition
 - b. Properties of atmospheric layers
 - c. Variation of pressure, temperature, and density with height
2. Atmospheric optics
 - a. Perspective phenomena
 - b. Terrestrial refraction and its optical effects
 - c. Astronomical refraction
 - d. Refraction by particulates–rainbows and halo phenomena
 - e. Diffraction phenomena–coronas and glories
 - f. Rayleigh scattering
3. Solar and terrestrial radiation
 - a. Properties of radiation and radiation laws
 - b. The solar spectrum
 - c. The spatial and temporal distribution of solar energy
 - d. Longwave radiation and the greenhouse effect
 - e. Surface and global energy budgets
4. Cloud microphysics
 - a. Atmospheric aerosols
 - b. Cloud droplet growth
 - c. Cold cloud microphysics
5. Atmospheric electricity
 - a. Fundamental principles of electrostatics
 - b. Origin and distribution of ions
 - c. Charge separation in clouds
 - d. Lightning
6. Meteorological acoustics
 - a. Sound propagation in the atmosphere
 - b. Refraction of acoustic energy
 - c. Sounds of meteorological origin



EVALUATION

There will be two preliminary exams and a comprehensive final exam to assess your progress through the semester. Each exam will take place during regular class meeting times. Those not graduating this semester may opt to take the final exam during finals week. Several problem sets will strengthen your skills and reinforce the lecture material. These problem sets will be assigned as we make sufficient progress on each topic, but you can expect approximately one problem set every two weeks and you will have one week to complete each assignment. You will also prepare a research paper to gain an even deeper understanding of a particular topic with the additional goal of learning how to review scientific literature and prepare references.

There will be no opportunities for make-up exams. Exams must be taken on the scheduled date. The *only* exceptions to this rule are: (1) serious medical condition (illness or injury) of you or an immediate family member; (2) University excused absence; (3) jury duty; or (4) military orders. Only in such instances will an item be dropped or rescheduled depending on your best interests, but *only if I am notified at least 24 hours in advance*. Except under the circumstances described above, **homework is due at 5:00 p.m.** on the scheduled due date. This will allow you to run home and get your completed assignment if you forgot it! I will accept homework up to 24 hours late (5:00 p.m. the following day) for a 50% late penalty. *Homework more than 24 hours late will not be graded.* In the event of an unforeseen circumstance that causes you to miss an exam or homework due date, *you must notify me by phone or e-mail within 24 hours of the event.* Appropriate documentation must accompany any excused absence and should be attached to a late homework assignment.

RESEARCH PAPER

Please prepare a brief paper (4–6 pages) based on current scientific literature (i.e., books or journal articles) that reviews or discusses a topic from the field of physical meteorology. You may select the topic from the lecture material or choose something in which you have a particular interest. This is a wide range of topics since the scope of physical meteorology generally includes almost any process or phenomenon of the atmosphere with the exception of dynamic processes. The paper must include a reference list prepared following AMS guidelines. See the class Web site for a list of potential topics and further information.

GRADING

Preliminary Exams	30%
Homework Assignments	30%
Research Paper	20%
Final Exam	20%

I reserve the option to curve the final grades upward at my discretion. However, you are guaranteed *at least* the following based on your final score before applying any curve:

A	≥92.0%	C	72.0–77.9%
A-	90.0–91.9%	C-	70.0–71.9%
B+	88.0–89.9%	D+	68.0–69.9%
B	82.0–87.9%	D	60.0–67.9%
B-	80.0–81.9%	F	<60.0
C+	78.0–79.9%		

Final grades are not negotiable. If you see a problem with any other grade, you may plead your case no later than 14 days from the date I return the assignment to the class. I do make mistakes. Under no circumstances will your grade be *lower* if you see me with a question.

ACADEMIC INTEGRITY

Since the point of this or any class is to learn, you may collaborate on homework assignments, but *you absolutely must make sure that you hand in your own work*. Copying your friend's answers will not only be obvious to me, but will result in both of you sharing the credit for that answer. For example, if you do a fantastic job on the homework assignment and then let three of your friends copy *any part of it*, you will each receive a maximum grade of 25% for the assignment. Any collaboration on exams is simply cheating. Please do not plagiarize someone else's work and hand it in as your research paper. I have zero tolerance for academic misconduct and will deal with the problem by immediately filing charges through the regular University channels.

NOTES

Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Disability Services Office prior to receiving accommodations in this course. The Disability Services Office is located in Lipinsky Hall, room 107, phone 828-232-5050.

