CLIM-111/PHYS-111 Syllabus

Introduction to Fundamentals of Atmospheric Science
Fall Semester, 2020
Mondays and Wednesdays, 10:30-11:45am
Online Synchronous Lectures (recorded)
Instructors: Michael E. Summers (msummers@gmu.edu)
and Zafer Boybeyi (zboybeyi@gmu.edu)
Updated August 24, 2020

Introduction: This course is an introduction to the fundamental physical and chemical aspects of the Earth's atmosphere. This includes an overview of Earth's history along with the processes that control the atmosphere's state, evolution, and climate. A central theme in this course is the development of a "big picture" view of the interacting spheres of the Earth's atmosphere-ocean system, e.g., clouds physics and precipitation, atmospheric heating and cooling processes, atmospheric dynamics, climate change and human influences.

Course Learning Outcomes: By the end of the semester students will understand:

- ***Temperature and its variation in the atmosphere.***
- ***Solar influences and heating that drive atmospheric thermodynamics and motions.***
- ***The Earth's energy budget.***
- ***Atmospheric moisture and the role of water in stability considerations.***
- ***Cloud formation, precipitation and the range of cloud occurrences on other planets.***
- ***Atmospheric motions and the general circulation.***
- ***Weather maps.***
- ***The climate system, variability, and climate controls.***
- ***The properties and processes that control planetary habitability.***
- ***The atmospheric science issues that are related to global change.***

Instructor and Contact Information

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Additional hours by appointment.

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Online Office Hours: Mondays and Wednesdays, 9:00-10:30am
Additional hours by appointment.

Course Blackboard website: https://gmu.blackboard.com/

In order to comply with student privacy laws, faculty and students need to use their GMU email accounts when corresponding with each other.

Mason Core General Education Course: CLIM-111/PHYS-111 is part of the general education program at GMU and satisfies the requirements of the Mason Core for lecture courses:

"The general education natural sciences courses engage students in scientific exploration; foster their curiosity; enhance their enthusiasm for science; and enable them to apply scientific knowledge and reasoning to personal, professional and public decision-making."

The central objectives of the Mason Core are to help the student:

1. Understand how scientific inquiry is based on investigation of evidence from the natural world, and that scientific knowledge and understanding:
    a. evolves based on new evidence
    b. differs from personal and cultural beliefs
2. Recognize the scope and limits of science.
3. Recognize and articulate the relationship between the natural sciences and society and the application of science to societal challenges (e.g., health, conservation, sustainability, energy, natural disasters, etc.).
4. Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information).
5. Participate in scientific inquiry and communicate the elements of the process, including:
    a. Making careful and systematic observations
    b. Developing and testing a hypothesis
    c. Analyzing evidence
    d. Interpreting results

CLIM-111/PHYS-111 is a Mason Core general education natural science course, designed to help students understand the scientific process and to develop their scientific reasoning skills in the context of atmospheric science. This course has for its subject the nature of the atmosphere of the Earth and how it changes with time.

The main goals of the CLIM-111/PHYS-111 include showing the student how atmospheric scientists have come to know what they know about the Earth's atmosphere. The student will learn that this is accomplished by the study of the light from the sun that heats the atmosphere and biosphere, and by the study of how the atmosphere responds to the sun's heat in terms of temperature changes, compositional changes, and dynamical changes. This satisfies the Mason Core objective (1). Atmospheric science is a type of science known as applied science. As such it continually strives to understand more and more about how the atmosphere is changing and of the causes of those changes. That satisfies Mason Core objective (2). Students will also learn about the nature of the Earth, and how the state of the Earth is changing as a result of both natural and human-caused processes. This satisfies objective (3) of the Mason Core. And finally, students will learn about the processes by which science operates, and in particular how the careful evaluation of observational evidence is driver of scientific progress. The student will

learn how scientists evaluate scientific evidence. This course is designed to help students develop the essential skills of analytical and quantitative reasoning, information gathering, and communication related to issues in natural sciences. This satisfies the Mason Core (4). The mastery of Mason Core (5) is found in the associated lab course, CLIM-112/PHYS-112, which deals with careful scientific observations and their analysis.

General Course Goals:

The overarching goal of this course is to understand the Earth's atmosphere, its complex history, its expected future evolution, and human influences.

Specific Course Goals:

1) ***an overview of the important physical and chemical processes which control the state, variability, and evolution of the Earth's atmosphere in the context of what we have learned from exploration of other planetary atmospheres,***
2) ***an understanding of the key scientific discoveries and remaining unanswered questions in atmospheric science,***
3) ***an overview of the primary scientific principles and analytical tools used in atmospheric science studies, including both remote sensing and in-situ techniques, with special emphasis on model simulations to visualize the complex feedbacks involved in atmospheric processes, and***
4) ***an understanding of the application of the scientific method to analyze and interpret observations of components of the atmospheric system.***

Course format:

(1) Lectures covering material in the Lutgens, Tarbuck & Tasa (LTT) 14th editions.
(2) Homework assignments designed to illustrate various aspects of topics encountered in the lectures and readings.
(3) Reading assignments both from the text and supplemental material
(4) Quizzes
(4) Two in-semester **exams**
(5) Final Exam

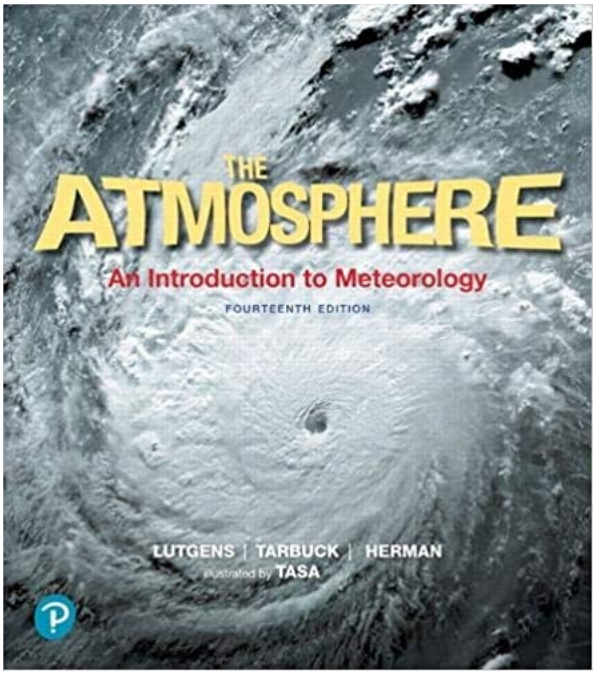
Lectures: The lectures will follow the chapters of the text as shown in the Course Schedule below; additional materials that represent recent developments in atmospheric science will also be presented in class. **You are responsible for all of the material covered in lectures, in addition to that in the text. You should read the assigned chapters BEFORE they are discussed in class; this will enable you to ask questions in class if you do not understand some aspect(s) of the chapters.**

You are expected to spend at least as much time reading the text and studying on your own as you spend in the classroom.

Lectures and Presentations: After each online lecture, I will post the lecture PowerPoint slides on Blackboard that contain that day's presentation. **Lectures will be recorded.**

Attendance: Because you are responsible for all materials and announcements (including exam information, and e.g., important date changes), attending the online class lecture is very important. **After the mid-terms I always get students wanting to know how to improve their grades. The best way to get good grades is to read the chapters before the lectures and to attend the online lectures. There is no better advice that I can offer.** Oral announcements made in class are binding and it is your responsibility to find out what was announced in any class you might miss.

Required Text:
The Atmosphere: And Introduction to Meteorology, 14th Edition,
Lutgens, Tarbuck, Herman, & Tasa, **Publisher:** Pearson; 14 edition, **ISBN-10:** 0134758587
ISBN-13: 978-0134758589, 2016



Tentative Course Schedule
Week 1 Aug. 24, 26: Chapter 1 - Introduction (Summers)
Week 2 August 31, Sept. 4; Chapter 2 – Heating (S)
Week 3 Sept. 7 (no classes), 9: Chapter 3 – Temperature (S)
Week 4 Sept. 14, 16: Chapter 4 - Moisture and Stability (S)
Week 5 Sept. 21, 23: Chapter 5 - Precipitation (S),
Week 6 Sept. 28, 30: Chapter 6 - Air Pressure and Winds (S)
Week 7 Oct. 5 Chapter 7 - Circulation of the Atmosphere (S)
Exam #1 (Tuesday Oct. 7)

Change Instructor
Week 8 Oct. 12, 14: Chapter 8 - Air Masses (Boybeyi)
Week 9 Oct. 19, 21: Chapter 9 - Weather Patterns (B)
Week 10 Oct. 26, 28: Chapter 10 - Thunderstorms and Tornadoes (B)

Week 11 Nov. 2, 4: Chapter 11 - Hurricanes (B)
Week 12 Nov. 9, 11: Chapter 12 - Weather Analysis & Forecasting (B)
Week 13 Nov. 16, 18, (no classes 20nd): Thanksgiving Week
Week 14 Nov. 23 **(Exam #2)**, 25th (no classes): Chapter 13 - Air Pollution (B),
Week 15 Nov. 30, Dec. 2: Chapter 14 - The Changing Climate (B)
Final Exam (Cumulative): Wednesday, Dec. 15, 10:30am-1:15pm

This will be a fast-paced course! It will be very important to keep up with the chapter readings.

Course Policy and Grading:

Homework:	20%
Quizzes:	10%
*Two exams:	40%
**Final Exam:	30%

Numerical Grade Ranges:

A: 94-100%
A-: 90-93%
B+: 87-89
B: 83-86%
B-: 80-82%
C+: 77-79
C: 73-76%
C-: 70-72%
D: 60-69%
F: Below 60%

*You are responsible for all material from text and any additional assigned readings.
**The Final Exam is Comprehensive – covering all material covered in the course

Important Notes:

- If you begin more than 20 minutes late for an exam, or after anyone else has finished the exam, you may not take that version of the exam.
- **Anyone caught cheating on an exam will be referred to the George Mason University Honor Council.**
- **The exams are closed book, closed to notes and all outside materials. Use of outside materials constitute cheating.**
- **If you have a schedule conflict and cannot take an exam on the scheduled day, let me know ahead of time and we will try to arrange an alternative test date.**

Makeup Policy:

- **There will be no makeup for quizzes. But I drop the lowest quiz score.**
- Students will be permitted to submit late homework on a case-by-case basis.

- Late exams will be permitted if the instructor is provided with an acceptable explanation and if performed within one week of the original exam. Make-up exams **must** be scheduled **IN ADVANCE** with instructor permission.

Important Dates:
First lecture: Monday, August 24, 10:30-11:45am EST
Exam #1, Wednesday, October 7
Exam #2, Monday, November 23
Final Exam: Wednesday, Dec. 15, 10:30am-1:15pm

Religious Holidays and Observations:
http://ulife.gmu.edu/calendar/religious-holiday-calendar/ is available to help minimize difficulties for students of different faiths. **It is the student's responsibility to speak to the instructor in advance should their religious observances impact their participation in class activities and assignments.**

Students with Disabilities:
If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474. All academic accommodations must be arranged through that office.

George Mason University Honor Code:
GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely.

What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form.

Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind), please ask for guidance and clarification.

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this:

Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

If you have questions about the meaning of the honor code please ask me. I expect you to hold to this standard by doing your own work on tests and assignments.

At a minimum follow these guidelines:

- ***Work identified as individual should be strictly your own.***
- ***Cheating on exams or presenting another's work as your own (plagiarism) will result in a zero grade for the assignment. Also, the case will be forwarded to the GMU Honor Council.***
- ***If in doubt about what constitutes plagiarism, please contact me.***

http://www.gmu.edu/departments/unilife/pages/honorcode.html