

Syllabus: Physics of Weather (PHYS 2400)



Class Location: Kinard 201

Class Hours: Tuesday and Thursday, 11:00 - 12:15. Students are expected to wait 15 minutes if the instructor is late for class.

Course start date: Thursday, Jan. 10, 2019

Course end date: Day of the final exam.

Instructor: Prof. Jens Oberheide

Email: joberhe@clemson.edu

Office Hours: Tuesday, after class until 2 pm. During the semester the schedule time may change occasionally due to schedule conflicts. Changes will be announced at least one day in advance.

Office Location: Kinard 102B.

Response Time: Instructor response time to emails is 12 hours. This response time excludes weekends and official University holidays. I encourage you to make use of the office hours or to arrange (via email) for a meeting outside the office hours if needed.

Required Materials

Computer System Requirements

A Windows or Mac computer (laptop) with reliable internet access.

Course Text Requirements

- *Understanding Weather & Climate* (Seventh Edition) by Aguado and Burt
eText: ISBN-13 **9780133943641**
Print: ISBN-13 **9780321987303**
- *Weather Studies eInvestigations Manual 2018-2019 edition*
eText: ISBN-13 **9781944970284**

Note that the textbook by Aguado and Burt is available in both print and digital format. The Investigations Manual is only available in digital format. Additional specific information about how to acquire and access the course texts will be posted separately.

Course Rationale

The course is designed (1) to give the students an appreciation of the broad variety of phenomena that occur in the atmosphere, (2) to give the students a basic understanding of the physical phenomena responsible for those phenomena, and (3) to use the atmospheric phenomena as an illustration of the principles of physics in a broader context. The course has relatively little math, but you are expected to be able to apply physical principles and scientific reasoning to explain various atmospheric phenomena and effects.

Catalog Description

Descriptive introduction to meteorology. Includes atmospheric thermodynamics, solar radiation, heat budget, atmospheric circulation, force laws governing air motion, fronts, precipitation, synoptic prediction. Special topics of current interest, such as the effect of environmental pollution on weather and the effect of weather on health, are included.

Course Objectives

The atmosphere is an extremely important physical system that strongly influences everything in our daily activities and both the short-term and long-term future of our society. It creates effects that range from minor inconveniences, in the form of inclement weather, to hazards, in the form of severe weather. Some of the most beautiful phenomena in nature occur in the atmosphere and are related to atmospheric optics effects and other types of physics. Specific objectives are to:

- Understand the structure of the atmosphere and the physical processes responsible for the structure.
- Assess the role of solar radiation and the Earth's orbital parameters and rotation in creating the seasons and large-scale climate zones.
- Describe the processes responsible for the planetary circulation.
- Understand weather systems, including the high and low pressure systems that constitute what is referred to as synoptic meteorology, as physical systems.
- Describe and analyze mesoscale weather systems, including thunderstorms and tornadoes.
- Explain the physical processes that lead to atmospheric electrification and lightning.
- Describe the processes that lead to atmospheric pollution and the effects of pollution on weather, climate, and health.
- Understand the physics of atmospheric optical phenomena.
- Understand basic techniques used in forecasting, primarily as a means of improving our understanding of how the atmosphere works.
- Describe the major climate cycle variations over decadal, century, and geological time scales and the mechanisms responsible for each.

All course assignments are closely aligned to and assess the student's mastery of these core objectives.

Course Content

This course contains fourteen modules (see Course Outline below), each consisting of the following components:

- Class: In each lesson, you will learn the key topics from the course materials in the two required texts. You are expected to read the relevant chapter(s) before a new module starts.
- Individual Assignments: These assignments will give you the chance to apply what you have learned and to demonstrate development of your skills related to the course content. You will complete a two-part assignment on Canvas for each module to demonstrate your mastery of the module material. Each assignment will include questions related to the *Understanding Weather and Climate* textbook material, as well as an exercise from the *eInvestigations Manual* that uses real-world data and illustrates the concepts described in the text material.
- In addition, both the MyMeteorologyLab web site provided by the text publisher and the American Meteorological Society web site associated with the *eInvestigations Manual* have interactive demonstrations that help to illustrate the concepts developed in each of the course modules.

Directions for completing course assignments are provided in the Modules area of the course Canvas site.

Course Outline

Chapter numbers refer to the text by Aguado and Burt:

- Composition and structure of the atmosphere (Chapter 1)
- Solar radiation and seasons (Chapter 2)
- Energy balance and temperature (Chapter 3)
- Atmospheric pressure and wind (Chapter 4)
- Atmospheric moisture (Chapter 5)
- Cloud systems (Chapter 6)
- Precipitation processes (Chapter 7)
- Atmospheric circulation (Chapter 8)
- Midlatitude cyclones (highs and lows) and fronts (Chapters 9 & 10)
- Lightning, thunder, and tornadoes (Chapter 11)
- Tropical storms and hurricanes (Chapter 12)
- Weather forecasting and analysis (Chapter 13)
- Climate (Chapters 15 & 16)
- Atmospheric optics (Chapter 17)

Web sites

The main course web site is on Canvas, accessible at <http://clemsun.edu/canvas/>. Chapter notes, announcements, and assignments will be posted there. Exams during the semester and the final

exam will be taken online (but during class hours and in the lecture room) at the course Canvas web site.

In addition to the main course web site, we will use the American Meteorological Society web site that is a companion to the *Investigations Manual* used in the course. The site is accessible at <http://www.ametsoc.org/amsedu/login.cfm>. That site has information about current weather, links to current meteorological data in the format used by meteorologists and forecasters, and links to other web sites with resource material that may be useful or of general interest. The site also has online quizzes that you can take for practice or to help you in learning terminology and course-related information. Access to the site requires a username and password that is specific to Clemson and this course. The login information will be provided in a separate posting by the instructor.

Course Navigation

The primary menu items in the course menu provide access to these content areas:

- Announcements: Includes updates and reminders
- Syllabus: Explains the course objectives, grading criteria, student responsibilities, and other items of interest.
- Modules: Provides notes and assignment information to prepare students for assignments.
- Pages: various content with information relevant to the course material or management of the course.
- Discussions: Provides forums for interacting with the instructor and/or other students in the course.
- Grades: Displays module and quiz scores as well as instructor feedback.

Grading

Assignments in this course are divided into these general categories, which carry the following weight in your final grade calculations:

Category	Weight
Module assignments	55%
Online quizzes	30%
Final exam	15%

- There will be three online quizzes (taken at home) during the semester and a final exam (taken in-class). Each of the three quizzes has the same weight and the same approximate length and format. The lowest of the three quiz scores will be dropped, and the remaining

two scores will constitute 30% of the course grade, i.e., 15% each for the highest two quiz scores. The final exam is comprehensive and will be taken on the day of the final exam in class (but online). It will constitute 15% of the course grade.

- A total of 14 weekly homework exercises, corresponding to the 14 course outline topics above, will make up the remaining 55% of the course grade. The overall homework grade will be calculated from the best 12 of the 14 homework grades.

You are treated as a professional in the course. Accordingly, the grading is strict, but fair. Reading the directions and grading criteria provided for each assignment is the key to understanding how you will be graded. Following those directions is the key to doing well.

Module Assignments (Weekly Homework)

Homework will be assigned on a weekly basis. There will be 14 weekly homework assignments. The two lowest scores will be dropped for the calculation of the final course grade.

Important: Completing and submitting the assigned homework exercises no later than the assignment deadline is required as part of the course grade. Late homework will not be accepted without a very good excuse, at the discretion of the instructor. You are required to notify the instructor one day prior to the deadline if a homework assignment will not be submitted. Failure to do so will result in a zero grade on the homework assignment.

The homework assignments will be completed online at the course web site.

You are welcome to discuss general aspects of the homework assignments with the instructor or with other students, but the homework that you submit should represent your own independent work. Copying from other students or from web material or other reference material is not acceptable. Students should adhere to the University's honor code and the ethics and academic integrity standards (see Academic Integrity Policy below, particularly the plagiarism definition)

Online Quizzes and Final Exam

There will be three 60-minute quizzes during the semester and a longer comprehensive exam on the day of the final exam. See Grading for weights and format. The quizzes will be made available and taken online. In general, there will be a 12-hour window on the date of the quiz when the quiz will be available online. You will have 60 minutes to complete the quiz after you start taking it. The questions are presented one at a time with no option for backtracking. You are expected to complete the quizzes independently with no outside help, either from resources on the web or from other individuals.

The Respondus Lock-Down Browser will be required when taking the quizzes. Additional information about accessing and installing the Respondus browser will be posted at least a week prior to the date of the first quiz.

Grading Scale

- A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69%, F = 0-59%
- A = 90 to 100% The student has demonstrated exemplary performance in meeting the course
- B = 80 to 89% The student has demonstrated superior performance in meeting the course
- C = 70 to 79% The student has adequately met the objectives established for the course.
- D = 60 to 69% The student has minimally met the objectives established for the course.
- F = 0 to 59% The student has failed to meet the objectives established for the course.

Student Disability Services

Student Disability Services coordinates the provision of accommodations for participants with disabilities in compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990.

Reasonable and specific accommodations are developed with each student based on current documentation from an appropriate licensed professional. All accommodations are individualized, flexible, and confidential based on the nature of the disability and the academic environment. Housing accommodations for a disability or medical condition are also coordinated through this office.

Visit the [Student Disability Services](#) website for location, contact information, as well as official policies and procedures. To learn more information or request accommodations contact Student Disability Services (SDS) at sds-l@clermson.edu or [864.656.6848](tel:864.656.6848) or visit [SDS's website: http://www.clemson.edu/campus-life/campus-services/sds/about.html](http://www.clemson.edu/campus-life/campus-services/sds/about.html).

Copyright Notice

The materials found in this online course are strictly for the use of participants enrolled in this course and for purposes associated with this course; they may not be retained or further disseminated. Clemson participants, faculty, and staff are expected to comply fully with institutional copyright policy as well as all other copyright laws.

Attendance Policy

Attendance is required for the first class. Thereafter, it is not required but is *strongly recommended*. It is the responsibility of the student to be aware of what is announced in class, including changes to assignments. Please also see the general statement on attendance in the Undergraduate Announcements. The instructor reserves the right to make attendance mandatory for individual students on a case-by-case basis.

Academic Integrity Policy

The Clemson University statement on academic integrity applies. It reads: *As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating or stealing in any form.*

Important: A simple definition of plagiarism is when someone presents another person's words, visuals, or ideas as his or her own. The instructor will deal with plagiarism on a case-by-case basis. The most serious offense within this category occurs when a student copies text from the Internet or from a collective file. This type of academic dishonesty is a serious offense that will result in a failing grade for the course as well as the filing of a formal report to the University.

See the [Undergraduate Academic Integrity Policy](#) website for additional information about academic integrity and Clemson procedures and policies regarding scholastic dishonesty.

Disability Access Statement

Students with disabilities requesting accommodations should make an appointment with Dr. Margaret Camp (656-6848), Director of Disability Services, to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

The Clemson University Title IX (Sexual Harassment) Statement

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. To locate information on the [Title IX policy, visit http://www.clemson.edu/campus-life/campus-services/access/title-ix/](#). Mr. Jerry Knighton is the Clemson University Title IX Coordinator, and is also the Director of Access and Equity. His office is located at 111 Holtzendorrf Hall, [864.656.3181](tel:864.656.3181) (voice) or [864.565.0899](tel:864.565.0899) (TDD).