

THE CLIMATE SYSTEM & GLOBAL CLIMATE CHANGE

Fall 2012
450:413-450:523
Tuesday & Thursday: Period 6: 5:00-6:20
Room 221 Beck Hall

INSTRUCTOR

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Office hours – Wednesday 3-4:30PM & by appointment

TEXT

Understanding Weather and Climate 6th edition, by Aguado & Burt
ISBN 10:0-321-76963-5; ISBN 13:978-0-321-76963-3
Additional readings:
Dire Predictions: Understanding Global Warming, by Mann and Kump
ISBN 978-0-1360-4435-2
and others to be assigned

COURSE DESCRIPTION & LEARNING GOALS

Climate is much more than just an average of weather conditions over an extended period of time (“climate is what you expect, weather is what you get”). Rather, climate in the broadest sense involves a series of energy transformations and exchanges within and between the atmosphere and the underlying surface. The climate system is far from static, varying on many scales of time and space. In this day and age, the climate system is impacting humankind and in turn, responding to human influences.

This course will explore the climate system and climate variability and change from a geographic perspective. The Earth's energy budget, hydrologic cycle, and atmospheric circulation will be examined at a variety of spatial and temporal scales. Along with past climate variability and change, present climate events and aspects of climate change will also be covered, including human impacts resulting from deforestation, atmospheric pollution, urbanization, and various other factors. Our planet's climate future will also be examined.

This course is intended for upper level undergraduates and graduates who have yet to take a climate course at an upper undergraduate level. The learning objectives are to: 1) learn theory, applications and the geography of the earth's climate and climate system, and 2) learn to apply theoretical concepts, observational data, and the application of simple models to understand the climate system and its geography.

COURSE REQUIREMENTS

Three exams

Undergrads: First exam determines 15% of the course grade; exams 2 & 3 are each worth 20%.
Grads: First exam determines 10% of the course grade; exams 2 & 3 are each worth 15%

Paper(s)

Undergrads: One 2500 word (7-8 page) paper; determines 25% of the course grade.
Grads: Two 2500 word papers; each determines 20% of the course grade.

The topic for the paper(s) must fall under one of the general themes below (grads cannot choose one theme for both papers). To be explained further in a handout.

Physical system (e.g., sun, atmosphere, lithosphere, clouds, hydrosphere, cryosphere; linkages, feedbacks) (minimize any emphasis on change)

Observation (e.g., ground-based, satellite, data quality control and archiving)

Modeling (e.g., physics, control, change scenarios, one-two-three dimensional)

Climate change (e.g., volcanoes, orbital parameters, desertification, greenhouse, aerosols, urban)

Regional Essay: Determines 10% of your grade. To be explained in a handout.

Occasional assignments: Determine 10% of the course grade.

Research Study Opportunity: During this course, you are invited to participate in a research study that is being conducted by Margaret Holzer, Ph.D. Candidate in the Learning and Teaching Department of the Rutgers University Graduate School of Education. The purpose of this research is to determine whether data images, graphs, and diagrams can assist a student in learning scientific content. The study will not affect your course grade, and you are not required to participate. The results of her study have the ability to inform how climate information is conveyed.

GRADING:

A:90.0-100% B+:87.5-89.9 B:80.0-87.4% C+:77.5-79.9% C:70.0-77.4% D:60.0-69.9 F:<60.0%

COURSE INFORMATION VIA THE WEB

<https://sakai.rutgers.edu/portal>

CLASS POLICY

Extra credit: Not available under any circumstances.

Exams: Every effort must be made to take exams when scheduled. No unexcused make-up exams will be given without WRITTEN documentation. Those with valid excuses will be allowed to take exams in a method determined by the instructor.

Assignments/Essay/Paper(s): Each must be submitted in **HARDCOPY** format on or before the day it is due (5PM deadline). A submission will lose 5% for each day it is late.

Attendance: You are expected to attend class; attendance is one of the best prognosticators of a student's performance. If you expect to miss one or two classes, please use the university absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

Tardiness and Leaving Class Early: Our University is geographically challenged. Students must commute considerable distances between classes and I am aware of problems you encounter in trying to come to class on time. I recognize that some tardiness is inevitable; however habitually arriving in class late and departing early is disruptive and rude. I ask that you make every effort possible to get to class on time, and once there, remain. If you must leave early, make sure to sit as close to the door and depart as unobtrusively as possible.

Personal Conversation: It is rude and disruptive to engage in personal conversation during class. Students who persist in this disruptive behavior may be asked to leave. Refusal to leave class once requested will result in disciplinary action at the Dean's level. Cell phones should be turned off while class is in session; this includes no text messaging. Laptops may be used to take notes, not for anything else.

Academic Integrity: The Geography Department fully endorses a no-tolerance cheating and plagiarism policy. If you are caught cheating, you may be failed and disciplinary action may be taken.

Short version: Don't cheat. Don't plagiarize.

Longer version: Cheating on tests or plagiarizing materials in your papers deprives you of the educational benefits of preparing these materials appropriately. It is personally dishonest to cheat on a test or to hand in a paper based on unacknowledged words or ideas that someone else originated. It is also unfair, since it gives you an undeserved advantage over your fellow students who are graded on the basis of their own work. In this class, cheating will be taken very seriously. All suspected cases of cheating and plagiarism will be automatically referred to the Office of Judicial Affairs and penalties will be recommended appropriate to the gravity of the infraction. The university's policy on Academic Integrity is available at http://academicintegrity.rutgers.edu/files/documents/AI_Policy_9_01_2011.pdf¹ I advise you to familiarize yourself with this document, both for this class and for your other classes and future work.

Since what counts as plagiarism is not always clear, here is the definition given in Rutgers' policy: Plagiarism: Plagiarism is the use of another person's words, ideas, or results without giving that person appropriate credit. To avoid plagiarism, every direct quotation must be identified by quotation marks or appropriate indentation and both direct quotation and paraphrasing must be cited properly according to the accepted format for the particular discipline or as required by the instructor in a course. Some common examples of plagiarism are:

- Copying word for word (i.e. quoting directly) from an oral, printed, or electronic source without proper attribution.
- Paraphrasing without proper attribution, i.e., presenting in one's own words another person's written words or ideas as if they were one's own.
- Submitting a purchased or downloaded term paper or other materials to satisfy a course requirement.
- Incorporating into one's work graphs, drawings, photographs, diagrams, tables, spreadsheets, computer programs, or other nontextual material from other sources without proper attribution.²

A SPECIAL NOTE: Students often assume that because information is available on the Web it is public information, does not need to be formally referenced, and can be used without attribution. This is a mistake. *All* information and ideas that you derive from other sources, whether written, spoken, or electronic, must be attributed to their original source. Such sources include not just written or electronic materials, but people with whom you may discuss your ideas, such as your roommate, friends, or family members. They deserve credit for their contributions too!

Judgments about plagiarism can be subtle. If you have any questions, please feel free to ask me for guidance.

¹ This web link was corrected on July 13, 2012. S. Lawrence

² http://academicintegrity.rutgers.edu/files/documents/AI_Policy_9_01_2011.pdf Updated with the University's current language on July 13, 2012. S. Lawrence

SCHEDULE

THE BIG PICTURE

September 4 & 6 Introducing climate & climate change.....with a NJ focus

ASSEMBLING THE CLIMATE SYSTEM (readings to be completed prior to class)

September 11	Composition & structure of the atmosphere	chapter 1
September 13 & 18	Solar radiation, energy balance & temperature	chapters 2 & 3
September 20 & 25	Atmospheric pressure & wind	chapter 4
September 27	EXAM 1	
October 2 & 4	Atmospheric moisture, clouds & precipitation	chapters 5-7
October 9 & 11	Atmospheric circulation & pressure distributions	chapter 8
October 16	Air masses and fronts	chapter 9
October 18	Mid-latitude cyclones Weather forecasting & analysis First graduate term paper due	chapter 10 chapter 13
October 23	Extreme weather and climate	chapters 11-12
October 25	Earth's climates Regional essay due	chapter 15
October 30	Regional essay presentations	
November 1	EXAM 2	

EXPLORING CLIMATE CHANGE

November 6 & 8	Climate change: past	chapter 16 & <i>Dire Predictions</i>
November 9	Rutgers Climate and Society Symposium (more information to follow)	
November 13 & 15	Climate change: recent	
November 20, 27 & 29	Causes of climate change: natural & anthropogenic	chapter 14&16
December 4	Future climate	
December 6	Climate & Society	
December 11	Term paper presentations Term paper due (undergrad and second grad)	

Wednesday December 19, noon **EXAM 3** (not cumulative) (held in regular classroom)