

SYLLABUS  
**EAS 4410/8803 Climate & Global Change**  
**Fall 2017**  
**MWF 9:05-9:55 ES&T L1175**

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**Course Description:** The course will explore the scientific fundamentals underpinning our understanding of how increased atmospheric carbon dioxide will lead to global climate change. It will also explore how changes in radiative forcing from other causes and natural climate variability impact climate, feedbacks in the climate system, impacts of climate change on the global environment, and the basics of the global carbon cycle and the fate of anthropogenic carbon.

**Learning Outcomes:** By the end of the course, the student should have a good understanding of what we know with confidence, what is less certain, and be able to make well-informed assessments of new developments as they arise. **In addition, students registered for the graduate section will have a broad context in which to place their research as it relates to Climate and Global Change.**

**Audience:** EAS 4410 is intended for upper level undergraduate students interested in learning more about this topic. There are no prerequisites, and the course will be appropriate for students in any field of study. However, we will draw on scientific concepts that students will have learned in introductory science classes. Non-science and engineering students who had a strong science background in high school are welcome. **The graduate section (EAS 8803) is appropriate for all graduate students regardless of area, but is especially important for those whose area of research touches on issues of climate and global change.**

**Format:**

*Mondays* will focus on material from the Archer book. Students are expected to read the Archer chapter and watch the appropriate videos before class. The instructor will clarify any concepts from the reading and videos as necessary, and introduce the Exercise (usually based on an on-line model). Class time may also be used to start work on the Exercises. *Wednesdays* are generally lectures which present additional material not contained in the Archer Book. Students are expected to take notes, but the lecture illustrations will be posted on t-square after class. ***Fridays will focus on the discussion of current climate related news and media (EAS4410) and journal articles (EAS8803).*** Students are expected to read the assigned sources and come prepared with questions and points for discussion. The material from the Henson textbook supports the lectures and discussions and should be read before Friday each week. Students may also submit questions about the Henson reading.

**Assignments:**

EAS 4410 only: Unless otherwise noted, Study Questions (as quiz on t-square) for the Archer Chapter are due Sunday at 5pm. You will also have the opportunity indicate any concepts that you would like to see clarified in class. EAS8803 students may submit their questions by email.

Unless otherwise noted, Chapter Exercises are due Wednesday before the start of class.

Three questions for discussion will be submitted (uploaded to t-square) before the start of discussion classes.

EAS8803 only: 2000-3000 word term paper reviewing the current state of knowledge on an approved topic related to anthropogenic climate change. Due on first day of Final Exams unless earlier deadline has been agreed on in advance.

**Help:**

Office hours are by appointment. If you would like to meet with the instructor, please send an email with 3 suggested meeting times. If you plan to take advantage of office hours, note that handguns are not permitted in faculty offices or office suites at any time. Students should submit any questions about the course content, assignments and logistics to Piazza. Please email the instructor only with questions that are specific to you (excused absences, requests for office hours, etc.).

**Texts:**

Archer, D. *Global Warming: Understanding the Forecast*, 2<sup>nd</sup> Ed , Wiley, 2012.

Henson, R. *The Thinking Person's Guide to Climate Change*, American Meteorological Society, 2014.

Supplemental news articles and web resources (EAS4410) and journal articles (EAS8803) will be assigned for discussion.

**Web Resources:**

<http://climatemodels.uchicago.edu>

<http://forecast.uchicago.edu/lectures.html> (I recommend using Coursera format video lectures)

<http://www.ipcc.ch/report/ar5/wg1/>

## Grading:

- (20%) Study questions: No credit for late submissions, half credit for on time submission, full for correct responses. Lowest two grades will be dropped.
- (10%) Discussion: 1 = questions submitted on time and ready to discuss, 0 = not submitted on time or not present. Lowest two grades be dropped
- (40%) Exercises: Exercises are graded on a 10 point scale. 2 point grade penalty for each day late. Lowest grade will be dropped.
- (30%) Two Midterm Exams and Final (10% each)

**EAS 8803: Study Questions will not be submitted or assessed. Term paper will be 20% of the final grade.**

**Attendance:** No student will receive a passing grade for the course if they miss six or more classes without an official excused absence. The Institute Absence policy is available at: [www.catalog.gatech.edu/rules/4/](http://www.catalog.gatech.edu/rules/4/)

**Honor Code:** All potential honor code violations will be reported to the Office of Student Integrity. No books, notes, or collaboration are allowed on exams. While collaboration is allowed on Exercises, each student must submit their own write-up in their own words.

**Classroom Expectations:** Class will start promptly at 9:05. Late arrival is disruptive to the lecture and to your fellow students. Questions from students during lectures are encouraged. If you are confused, likely someone else is as well. All viewpoints, presented respectfully, are valued in class discussion.

## **Preliminary Schedule (*Will be adjusted as needed throughout the semester*):**

### Week 1 (8/21):

M: Introduction

W: *Lecture:* Global Climate Overview

F: *Lecture:* Climate Model Overview

*Archer Chapter 1*

[https://www.meted.ucar.edu/nwp/climate\\_models/](https://www.meted.ucar.edu/nwp/climate_models/)

### Week 2 (8/28):

M: *Clarification/Exercises:* Archer Chapter 2

W: *Lecture:* Climate Change Overview

F: *Discussion:* Politics of Climate Change (Valley)

*Archer Chapter 2 Blackbody Radiation*

*Henson Chapter 1 Climate Change: A primer*

### Week 3 (9/4): *Note: Monday is holiday, Study Questions due 9/5 5pm, Exercises 9/8*

W: *Clarification/Exercises:* Archer Chapter 3

F: *Lecture: Radiative Forcing: Solar Variability and Aerosols*  
*Archer Chapter 3 The Layer Model*

Week 4 (9/11):

M: CLASS CANCELLED

W: *Clarification/Exercises: Archer Chapter 4*

F: *Lecture: Radiative Forcing: Greenhouse Gases*  
*Archer Chapter 4 Greenhouse Gases*  
*Henson Chapter 2 The Greenhouse Effect*

Week 5 (9/18):

M: *Clarification/Exercises: Archer Chapter 5*

W: *Lecture: Water vapor and climate*  
*Archer Chapter 5 What Holds the Atmosphere Up?*  
*Henson Chapter 4 Extreme Heat*

**F: Midterm Exam 1**

Week 6 (9/25):

M: *Clarification/Exercises: Archer Chapter 6*

W: *Lecture: Heat waves, droughts and floods*

F: *Discussion: Extreme precipitation events and Hurricane Harvey*  
*Archer Chapter 6 Weather and Climate*  
*Henson Chapter 5 Floods and Droughts*  
*Henson Chapter 12 Circuits of Change*

Week 7 (10/2):

M: *Clarification/Exercises: Archer Chapter 7*

W: *Lecture: Clouds and Cloud Feedbacks*

F: *Discussion: Ongoing 2017 Hurricane Season*  
*Archer Chapter 7 Feedbacks*  
*Henson Chapter 8 Hurricanes and Other Storms*

Week 8 (10/9): *Note: Monday is holiday, Study Questions due 10/10 5pm, Exercises 10/13*

W: *Clarification/Exercises: Archer Chapter 8*

F: *Lecture: Carbon and Climate: Lessons from the Past*  
*Archer Chapter 8 Carbon on Earth*  
*Henson Chapter 11 The Long View*

Week 9 (10/16):

M: *Clarification/Exercises*: Archer Chapter 9  
W: *Lecture*: Carbon on Land: Biosphere Contributions and Feedbacks  
F: *Discussion* TBA  
    *Archer Chapter 9 Fossil Fuels and Energy*  
    *Henson Chapter 3 Who's Responsible?*  
    *Henson Chapter 9 Ecosystems and Agriculture*

Week 10 (10/23):

M: *Clarification/Exercises*: Archer Chapter 10  
W: *Lecture*: Ocean Acidification  
F: **Midterm Exam 2**  
    *Archer Chapter 10 The Perturbed Carbon Cycle*

Week 11 (10/30):

M: *Clarification/Exercises*: Archer Chapter 11  
F: *Lecture*: Climate Variability and Climate Change  
F: *Discussion* TBA  
    *Archer Chapter 11 The Smoking Gun*  
    *Henson Chapter 10 Keeping Track*

Week 12 (11/6):

M: *Clarification/Exercises*: Archer Chapter 12 Potential Climate Impacts  
W: *Lecture*: Sea Level  
F: *Discussion* TBA  
    *Archer Chapter 12 Potential Climate Impacts*  
    *Henson Chapter 6 The Big Melt*

Week 13 (11/13):

M: *Lecture*: Atlantic Ocean Circulation  
W: *Lecture*: Sea Ice  
F: *Discussion* TBA  
    *Henson Chapter 7 Oceans*

Week 14 (11/20):

M: *Clarification/Exercises*: Archer Chapter 13 (due at beginning class 11/27)  
    *Archer Chapter 13 Decisions, Decisions*

Week 15 (11/27):

M: *Lecture*: Alternative Energy and Carbon Capture

W: *Lecture*: Current Policies and Treaties

F: *Discussion*: Future of Climate Change Policies and Treaties

*Henson Chapter 14 The Predicament*

*Henson Chapter 15 Political Solutions*

Week 16 (12/4):

**M: Final Exam Review Session**

**Final Exam:** December 13 8:00am-10:50am

**Academic Integrity:**

Academic dishonesty will not be tolerated. This includes cheating, lying about course matters, plagiarism, or helping others commit a violation of the Honor Code. Some exams (when specifically announced in class) allow the use of self-prepared supporting information (one sheet of paper, either typed or handwritten, could be double-sided); no other support materials are allowed at tests. Plagiarism includes reproducing the words of others without both the use of quotation marks and citation. Students are reminded of the obligations and expectations associated with the Georgia Tech Academic Honor Code and Student Code of Conduct, available online at [www.honor.gatech.edu](http://www.honor.gatech.edu).

**Learning Accommodations:**

If needed, we will make classroom accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services (<http://disabilityservices.gatech.edu>).