

SYLLABUS  
EAS 4410/8803 Climate & Global Change  
Fall 2018  
MWF 11:15-12:05 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.

**Objectives:** 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/Pre-requisites:** 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* generally have 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 Canvas after class. *Fridays* will usually 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 a quiz on Canvas) 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 as a paper copy for the grader. Discussion preparation questions must be submitted (uploaded to Canvas) 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. Students should submit any questions about the course content, assignments and logistics to Piazza (integrated in Canvas). Please email the instructor only with questions that are specific to you (excused absences, requests for office hours, etc.).

**Required 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:**

All assignments and class resources will be posted or linked from Canvas.

<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.

Your final grade will be assigned as a letter grade according to the following scale:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
F	0-59%

**Attendance:** See catalog for institute policies for excused absences and make-up work: <http://www.catalog.gatech.edu/rules/4/>. No student will receive a passing grade for the course if they miss six or more classes without an official excused absence.

**Classroom Expectations:** Class will start promptly at 11:15. Late arrival is disruptive to the lecture and to your fellow students. Cellphone (including texting) or internet use has been shown to be disruptive to the learning of those around you, and should only be in support of class assignments. 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.

**Student-Faculty Expectations Agreement:** Georgia Tech strives for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectations for both students and faculty.

**Academic Integrity:** Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

**Collaboration and Group Work:** No books, notes, or collaboration are allowed on exams. Students may use their books and notes for the study questions (online quiz). While collaboration is allowed on Exercises, each student must submit their own write-up in their own words.

**Accommodations for Students with Disabilities:** If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter.

Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

**Statement of Intent for Inclusivity:** As a member of the Georgia Tech community, I am committed to creating a learning environment in which all of my students feel safe and included. Because we are individuals with varying needs, I am reliant on your feedback to achieve this goal. To that end, I invite you to enter into dialogue with me about the things I can stop, start, and continue doing to make my classroom an environment in which every student feels valued and can engage actively in our learning community.

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

*Unless otherwise noted below, Chapter Questions are due on Sunday at 5pm, Chapter Exercises are due at the beginning of class on Wednesday, and Discussion questions are due before the beginning of Discussion class on Friday.*

Week 1 (8/20): *Note: No Study Questions or Chapter Exercises due this week*

M: Introduction

W: *Lecture:* Global Climate Overview

F: *Lecture:* Climate Change Overview

*Archer Chapter 1*

*Henson Chapter 1 Climate Change: A primer*

Week 2 (8/27):

M: *Clarification/Exercises:* Archer Chapter 2

W: *Online Lesson:* Climate Models

F: *Discussion:* Are IPCC model based projections too conservative?

*Archer Chapter 2 Blackbody Radiation*

*Henson Chapter 12 Circuits of Change*

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

Week 3 (9/3): *Note: Monday is holiday, Study Questions due 9/4 5pm, Exercises 9/7*

W: *Clarification/Exercises:* Archer Chapter 3

F: *Lecture:* Radiative Forcing: Solar Variability and Aerosols

*Archer Chapter 3 The Layer Model*

Week 4 (9/10):

M: *Clarification/Exercises:* Archer Chapter 4

W: *Lecture:* Radiative Forcing: Greenhouse Gasses

*Archer Chapter 4 Greenhouse Gases*

*Henson Chapter 2 The Greenhouse Effect*

F: *Discussion:* Solar Geoengineering

Week 5 (9/17):

M: *Clarification/Exercises:* Archer Chapter 5

W: *Lecture:* Water vapor and climate

F: *Discussion:* California Fires

*Archer Chapter 5 What Holds the Atmosphere Up?*

*Henson Chapter 4 Extreme Heat*

Week 6 (9/24):

M: *Clarification/Exercises:* Archer Chapter 6

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

*Archer Chapter 6 Weather and Climate*

*Henson Chapter 5 Floods and Droughts*

F: **Midterm Exam 1 (covers Week 1-5)**

Week 7 (10/1):

M: *Clarification/Exercises:* Archer Chapter 7

W: *Lecture:* Clouds and Cloud Feedbacks

F: *Discussion:* Extreme Precipitation Events

*Archer Chapter 7 Feedbacks*

*Henson Chapter 8 Hurricanes and Other Storms*

Week 8 (10/8): *Note: Monday is holiday, Study Questions due 10/9 5pm, Exercises 10/12*

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 (10/15):

M: *Clarification/Exercises:* Archer Chapter 9

W: *Guest Lecture* Ecosystem Impacts

F: *Lecture:* Carbon on Land: Biosphere Contributions and Feedbacks

*Archer Chapter 9 Fossil Fuels and Energy*

*Henson Chapter 3 Who's Responsible?*

*Henson Chapter 9 Ecosystems and Agriculture*

Week 10 (10/22):

M: *Clarification/Exercises:* Archer Chapter 10

W: *Lecture:* Ocean Acidification

F: *Discussion* Carbon Sequestration

*Archer Chapter 10 The Perturbed Carbon Cycle*

Week 11 (10/29):

M: *Clarification/Exercises:* Archer Chapter 11

W: *Lecture:* Climate Variability and Climate Change

*Archer Chapter 11 The Smoking Gun*

*Henson Chapter 10 Keeping Track*

**F: Midterm Exam 2 (Covers Week 6-10)**

Week 12 (11/5):

M: *Clarification/Exercises:* Archer Chapter 12 Potential Climate Impacts

W: *Lecture:* Sea Level

F: *Discussion:* Coastal Impacts of Sea Level Rise

*Archer Chapter 12 Potential Climate Impacts*

*Henson Chapter 6 The Big Melt*

Week 13 (11/12): *Note: No Study Questions or Chapter Exercises due this week*

M: *Lecture:* Atlantic Ocean Circulation

W: *Lecture:* Sea Ice

F: *Discussion:* Harmful Algal Blooms

*Henson Chapter 7 Oceans*

Week 14 (11/19): *Note: Chapter Exercises due at beginning of class 11/26*

M: *Clarification/Exercises:* Archer Chapter 13

*Archer Chapter 13 Decisions, Decisions*

Week 15 (11/26): *Note: No Study Questions or Chapter Exercises due this week*

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 (12/3): *Note: No Study Questions or Chapter Exercises due this week*

**M: Final Exam Review Session**

**Final Exam (covers Week 11-15):** December 7 11:20am-2:10pm

## Campus Resources for Students

In your time at Georgia Tech, you may find yourself in need of support. Below you will find some resources to support you both as a student and as a person.

### Academic support

- Center for Academic Success <http://success.gatech.edu>
  - 1-to-1 tutoring <http://success.gatech.edu/1-1-tutoring>
  - Peer-Led Undergraduate Study (PLUS) <http://success.gatech.edu/tutoring/plus>
  - Academic coaching <http://success.gatech.edu/coaching>
- Residence Life's Learning Assistance Program (<https://housing.gatech.edu/learning-assistance-program>)
  - Drop-in tutoring for many 1000 level courses
- OMED: Educational Services (<http://omed.gatech.edu/programs/academic-support>)
  - Group study sessions and tutoring programs
- Communication Center (<http://www.communicationcenter.gatech.edu>)
  - Individualized help with writing and multimedia projects
- Academic advisors for your major (<http://advising.gatech.edu/>)

### Personal Support

#### Georgia Tech Resources

- The Office of the Dean of Students: <http://studentlife.gatech.edu/content/services>; **404-894-6367**; Smithgall Student Services Building 2<sup>nd</sup> floor
  - You also may request assistance at [https://gatech-advocate.symlicity.com/care\\_report/index.php/pid383662?](https://gatech-advocate.symlicity.com/care_report/index.php/pid383662?)
- Counseling Center: <http://counseling.gatech.edu>; **404-894-2575**; Smithgall Student Services Building 2<sup>nd</sup> floor
  - Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention. Their website also includes links to state and national resources.
  - *Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at **404-894-2204**.*
- Students' Temporary Assistance and Resources (STAR): <http://studentlife.gatech.edu/content/need-help>
  - Can assist with interview clothing, food, and housing needs.
- Stamps Health Services: <https://health.gatech.edu>; **404-894-1420**
  - Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition
- OMED: Educational Services: <http://www.omed.gatech.edu>
- Women's Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230
- LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679
- Veteran's Resource Center: <http://veterans.gatech.edu/>; 404-385-2067
- Georgia Tech Police: 404-894-2500