

SYLLABUS

EAS 6500 Climate & Global Change

Fall 2020

MWF 11:00-11:50 Hybrid Mode

<https://bluejeans.com/813624820>

L1175 Ford ES&T

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Office Hours: by appointment via Bluejeans or phone

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 an understanding of the fundamental science behind the greenhouse effect, the concepts of radiative forcing and feedbacks, and the lifetimes of various atmospheric constituents. Students will gain a sense of what we know about the current and future changes in global climate with confidence, what is less certain, and be able to make well-informed assessments of the current literature. Students will gain a broad context in which to place their research as it relates to Climate and Global Change.

Audience/Pre-requisites: This class 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: Lectures will be posted online for asynchronous viewing or reading. Students will have the opportunity to clarify concepts presented in the lectures and assigned readings and discuss the study questions in the Monday and Wednesday tutorial groups. The *Monday* tutorial group will meet in-person whenever possible, either in L1175 or outdoors. The *Wednesday* tutorial group will meet online. Members of the Monday tutorial group are welcome to use L1175 on Wednesdays to view the lectures together. On *Fridays* will usually focus on the discussion of journal articles. These discussions will take place asynchronously online between 5pm Thursday and noon Friday. Students are expected to read the assigned articles and contribute questions and points for discussion.

Assignments:

The homework for each unit is due at midnight on the days indicated in the syllabus. While the homework must be uploaded to Canvas, clear photos or scans of handwritten assignments are fine. Discussion preparation questions must be submitted (uploaded to Canvas) by 5pm on Thursday prior to the start of the discussion. In lieu of exams, a subset of the study questions will be graded at the end of each unit.

Help: Office hours are by appointment and will take place on Bluejeans. If you would like to meet with me, please send an email with 3 suggested meeting times. Students should submit any questions about the course content, assignments and logistics to the appropriate Discussion in Canvas. Please email me with questions that are specific to you (excused absences, requests for office hours, etc.).

Required Texts:

IPCC AR5 Technical Summary
Other Book Chapters and Review Papers as assigned

All readings will be supplied as pdf on Canvas, no textbook purchase required.

Journal articles will be assigned each week for discussion.

Recommended Texts:

Henson, R. *The Thinking Person's Guide to Climate Change Second Edition*, American Meteorological Society, 2019.

Web Resources:

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

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

Grading:

(50%) Graded subset of study questions in lieu of exams

(30%) Homework is graded on a 10 point scale. 2 point grade penalty for each day late. Lowest grade will be dropped.

(20%) Discussion: 1 = questions submitted on time and ready to discuss, 0 = not submitted on time or not present. Lowest two grades be dropped.

Attendance: See catalog for institute policies for excused absences and make-up work: <http://www.catalog.gatech.edu/rules/4/>. Please attend remotely if you feel poorly for any reason.

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. While collaboration is allowed on the homework, each student must submit their own write-up in their own words. Students must write their own responses to the study questions that will be used in lieu of exams.

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):

Introduction

Readings:

Schneider Chapter 1 (1.1-1.2)
IPCC Technical Summary TS.1, BoxTS.1
IPCC Summary for Policy Makers

Week 1 (8/17):

Lectures (asynchronous): Global Climate Overview and Climate Change Overview

M: Introduction and Logistics (Synchronous via Bluejeans)

F: Tutorial (all students) on Intro Readings, Lectures and Study Questions (Synchronous via Bluejeans).

Unit 1: Radiation and Climate

Readings:

Schneider Chapter 2
IPCC Technical Summary TS.3, TS6.2, Box TS.2

Unit 1 Homework due Tuesday 9/11, Study Questions due Friday 9/11

Week 2 (8/24):

Lectures (asynchronous): Radiation, Greenhouse Gasses and Layer models

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion* Duren, “California’s methane super-emitters”

Week 3 (8/31):

Lectures (asynchronous): Radiative Forcing: Solar Variability and Aerosols, Greenhouse Gasses

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 4 (9/7):

No new lectures: finish reading, study questions, and Problem Set 1

M: Labor Day no class

W: Monday Tutorial Group (via Bluejeans)

F: Wednesday Tutorial Group (in person)

Unit 2: Convection, Moisture and Clouds

Readings:

Schneider Chapter 1 (1.3-1.4)

Held and Soden (2000) Excerpts

IPCC Technical Summary TS.2.7, TS.5, BoxTS.6, TS6.4, TFE.1, TFE.3, TFE.6, TFE.9

Unit 2 Homework due Friday 10/9, Study Questions due Wednesday 10/7

Week 5 (9/14):

Lectures (asynchronous): Radiative-Convective Equilibrium, Climate Models

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 6 (9/21):

Lectures (asynchronous): Global Climate Model Projections and Evaluation, Water vapor and Lapse Rate Feedbacks

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 7 (9/28):

Lectures (asynchronous): Clouds and Cloud Feedbacks

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 8 (10/5):

Lectures (asynchronous): Heat waves, droughts, floods and storms

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Unit 3: Carbon Sources and Sinks

Readings:

IPCC Technical Summary TS.2.8, TFE.7

Archer, Global Carbon Cycle, Ch. 4

Unit 3 Homework due Friday 10/30, Study Questions due Wednesday 10/28

Week 9 (10/12):

Lectures (asynchronous): Global Carbon Cycle 1 and 2

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 10 (10/19):

Lectures (asynchronous): Ocean Carbon Uptake, Ocean Acidification

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 11 (10/26):

Lectures (asynchronous): Land Carbon Sources, Sinks and Feedbacks

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Unit 4: Global Change

Readings:

IPCC Technical Summary TS2.1-2.6, TS6.1, TS.4, TS6.3, TFE.2, TFE.4, TFE.5, BoxTS.5

Unit 4 Homework due Friday 11/20, Study Questions due Wednesday 11/18

Week 12 (11/2):

Lectures (asynchronous): Observations of Climate Change, Climate Variability and Climate Change

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 13 (11/9):

Lectures (asynchronous): Ice Sheets, Sea Level

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 14 (11/16):

Lectures (asynchronous): Sea Ice, Atlantic Ocean Circulation

M: Monday Tutorial Group (via Bluejeans)

W: Wednesday Tutorial Group (in person)

F: *Discussion:* TBA

Week 15 (11/23):

M: TBA