

SCIENCE OF GLOBAL CLIMATE CHANGE (ATS 150)

INSTRUCTOR INFORMATION

Professor Eric D. Maloney (he/him/his)

Office: 208 Atmospheric Science West (Foothills Campus)

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Office Phone: 970-491-3368

Cell number: 970-286-9410

Maloney's Office Hours: Tuesday 11-12 (in Engineering A 102E), Friday 12-1 (Zoom) and by appointment (likely via Zoom).

Personal Zoom meeting room: <https://zoom.us/j/5348210795>

GRADUATE TEACHING ASSISTANT

Wei-Ting Hsiao (WeiTing.Hsiao@colostate.edu)

Wei-Ting's Office Hours (in Engineering A 102E): Tuesday 1-2, Thursday 11-12, and by appointment.

TEXT

I will not require you to buy a text book. However, we will instead use the Open Access textbook entitled *Introduction to Climate Science* by Andreas Schmittner at Oregon State (<https://open.oregonstate.education/climatechange/>). If you did want to purchase a supplementary text, *Introduction to Modern Climate Change* by Andrew Dessler is one to consider, especially for its good change on climate forcing and feedbacks. It can be found easily on Amazon and other places. I will also supplement the online text above with other readings that I will post in Canvas.

CLASSROOM

Wagar 232, Tu Thu @ 9:30-10:45 am. The class is offered in face-to-face format. The lectures will be recorded using Echo 360, and should be made available on the class website. In case I get sick and have to lecture remotely, we will do lectures by Zoom (link above), and I will post a recording.

WEB

Class webpage is available on Canvas, including links to readings, assignments, gradebook, etc. Captured Echo 360 lectures will also be available here.

CONTACT HOURS: 3

STUDENT LEARNING GOALS AND OBJECTIVES

Upon the completion of this course, students will be able to:

1. Describe how changes in radiation balance affect Earth's climate

2. Define and enumerate physical bases for climate forcing, feedback, and sensitivity
3. Calculate the relationships among emissions, CO₂, and warming
4. Describe the principles, strengths, & weaknesses of global climate models
5. Explain the use of emission scenarios and climate projections
6. Identify impacts of climate change on ecosystems and society
7. Articulate the technical & policy approaches to climate mitigation & adaptation, and key impediments to decarbonizing the world's economy

COURSE DISCUSSION

This course will provide the fundamental science needed to understand climate change and its impacts. Lectures will be presented from both descriptive and conceptual viewpoints that will include the physics that drives the Earth's climate. However, fundamental equations will also be developed that you will apply in your homework and on exams. These will be at the level of algebra. Assuming we have time, we will also cover some of the economics, policy, and human health impacts of climate change, with possibly a guest lecture or two.

Since the course steadily builds on previous material, it is important to understand what's happening as we proceed. Ask questions when you don't understand something, particularly questions regarding basic concepts. *At least 3 hours of effort are expected to complete readings and homework assignments outside of class for each hour of class time.*

On most weeks during the course, we will have homework assignments designed to build understanding of the material. There will not be a weekly assignment in the same weeks as the mid-term exams.

Maloney is available during office hours (or by appointment). The TA, Wei-Ting Hsiao, will hold office hours (above) to address questions encountered during the lecture, related to the assignments, and in studying for the exam.

Your grade will be derived from points received on homework assignments, two "mid-term" exams, and one final exam. Class participation will comprise 10% of the grade. The act of attending class will get you a long way toward a good participation grade. There will be no makeup midterm or final exams, unless circumstances are *extraordinary*.

GRADING

Your grade for this class will be based upon the following:

Class participation – 10%

Homework assignments (Approximately 6 assignments) – 30%

Midterm exam 1 – 20%

Midterm exam 2 - 20%

Final exam - 20%

Grades assigned for the class include: A+, A, A-, B+, B, B-, C+, C, D, F. Numerical scores will be curved at the end of the class before grades are assigned.

LECTURE TOPICS (AND CHAPTERS)

Week 1 (1/18, 1/20): Introduction and Earth System Overview

Week 2 (1/25, 1/27): Energy and Electromagnetic Radiation

Week 3 (2/1, 2/3): Layer Model of the Greenhouse Effect (HW1 due)

Week 4 (2/8, 2/10): Greenhouse Gases, Lapse Rates

Week 5 (2/15, 2/17): Energy Budget of the Earth (HW2 due)

Week 6 (2/22, 2/24): Weather, **Exam 1**

Week 7 (3/1, 3/3): Ocean circulation, Climate Sensitivity and Feedback

Week 8 (3/8, 3/10): Carbon Cycle, Paleoclimate (HW3 due)

Spring Break: March 14-18

Week 9 (3/22, 3/24): Historical Climate Changes

Week 10 (3/29, 3/31): Climate Models and Emissions Scenarios (HW4 due)

Week 11 (4/5, 4/7): Air Pollution and Climate, **Exam 2**

Week 12 (4/12, 4/14): Future Climate Change

Week 13 (4/19, 4/21): Climate Change Impacts, Climate and Human Health (HW5 due)

Week 14 (4/26, 4/28): **Tentative:** Sustainable Development, Climate Change Economics

Week 15 (5/3, 5/5): **Tentative:** Climate Change Policy (HW6 due)

Weekly Homework Assignments (except weeks with an exam) due: Sundays 11:59pm

Midterm Exam 1: Thursday, February 24 (tentative)

Midterm Exam 2: Thursday, April 7 (tentative)

Final Exam: Tuesday, May 10, 9:40-11:40 a.m.

IMPORTANT COVID-19 INFORMATION

Masks are required inside university buildings. You must also meet university vaccine or exemption requirements.

All students are expected and required to report to the COVID Reporter

(<https://covid.colostate.edu/reporter/>) when:

- You suspect you have symptoms of COVID, regardless of whether or not you are vaccinated and even if your symptoms are mild
- You have tested positive for COVID through a non-CSU testing site, such as home test or test at a pharmacy
- You believe you may have been exposed to COVID go to the COVID Reporter and follow the guidance under “I believe I have been in close contact with someone who has COVID-19.” This guidance will depend upon your individual circumstances

You will not be penalized in any way for reporting symptoms or concerns.

Do not ask me as your instructor to report for you. It is your responsibility to report through the COVID Reporter promptly.

As your instructor I may not ask you about vaccination status or if you have COVID but you may freely volunteer to send me information from a public health official if you have been asked to isolate or quarantine.

When you complete the COVID Reporter, the CSU Public Health office is notified. Once notified, that office will contact you and, depending upon each situation, will conduct contact tracing, initiate any necessary public health requirements, and notify you if you need to take any steps.

If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.

For the latest information about the University's COVID resources and information, including FAQs about the spring semester, please visit the CSU COVID-19 site <https://covid.colostate.edu/>.

COPYRIGHTED COURSE MATERIALS

Please do not share material from this course in online, print, or other media. Course material is the property of the instructor who developed the course. Materials authored by third parties and used in the course are also subject to copyright protections. Posting course materials on external sites (commercial or not) violates both copyright law and the CSU Student Conduct Code. Students who share course content without the instructor's express permission, including with online sites that post materials to sell to other students, could face appropriate disciplinary or legal action.

CSU PRINCIPLES OF COMMUNITY

Inclusion: We create and nurture inclusive environments and welcome, value and affirm all members of our community, including their various identities, skills, ideas, talents and contributions.

Integrity: We are accountable for our actions and will act ethically and honestly in all our interactions.

Respect: We honor the inherent dignity of all people within an environment where we are committed to freedom of expression, critical discourse, and the advancement of knowledge.

Service: We are responsible, individually and collectively, to give of our time, talents, and resources to promote the well-being of each other and the development of our local, regional, and global communities.

Social Justice: We have the right to be treated and the responsibility to treat others with fairness and equity, the duty to challenge prejudice, and to uphold the laws, policies and procedures that promote justice in all respects.

DIVERSITY AND INCLUSION

The [Mission, Vision, and Focus](#) webpage of the Commission on Diversity and Inclusion includes a comprehensive statement of CSU's commitment to diversity and inclusion.

ACADEMIC INTEGRITY & CSU HONOR PLEDGE

This course will adhere to the CSU [Academic Integrity/Misconduct](#) policy as found in the General Catalog and the [Student Conduct Code](#).

Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, I will ask that you affirm the CSU Honor Pledge as part of completing your work in this course.

Further information about Academic Integrity is available at CSU's [Academic Integrity - Student Resources](#).