

CLIM 690 Scientific Basis of Climate Change

Course Syllabus, Fall 2024

Instructor: Dr. Barry A. Klinger,

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Lectures: W 4:30 – 7:10 Research Hall 121

Office Hours: by appointment

Catalog Description

A rigorous treatment of global warming, especially with regard to anthropogenic causes, based on the IPCC 4th Assessment Report "The Physical Science Basis". Topics include 1) Overview of observed climate, 2) Variability of climate, 3) Modeling of climate response to greenhouse gas forcing, 4) Greenhouse gases, chemistry, and aerosols, and 5) Projections of climate change and its societal impact. **3 credits.**

Recommended prerequisites: BS or MS in a natural science or engineering, or instructor permission.

Reading

Required

Dessler, A. E., 2012: *Introduction to Modern Climate Change*, Cambridge University Press.

Klinger, B. A., et al., 2021: *How Bad? An Inquiry Into Climate Change Consequences*, in preparation.

Recommended

Tziperman, E., 2022: *Global Warming Science: A Quantitative Introduction...*, Princeton University Press.

Important summaries of climate change issues available online:

Assessment Reports, Intergovernmental Panel on Climate Change (IPCC, <https://www.ipcc.ch>), particularly AR5, AR6, and recent Special Reports, of

- Working Group I, Physical Science Basis
- Working Group II, Consequences of Climate Change and Options for Adaptation

National Climate Assessments, particularly Fifth National Assessment, 2023

(<https://repository.library.noaa.gov/view/noaa/61592>)

Other:

Carlson, G. L., 2022: *Human Health and the Climate Crisis*, Jones & Bartlett

Hartmann, D. L., 1994: *Global Physical Climatology*, Academic Press.

Houghton, J., 2009: *Global Warming, The Complete Briefing*, Cambridge University Press.

Peixoto, J. P., and A. H. Oort, 1992: *Physics of Climate*, American Institute of Physics.

Mathez, E. A., and J. E. Smerdon, 2018: *Climate Change, The Science of Global Warming and our Energy Future*, 2nd edition, Columbia University Press.

Trenberth, K. E. (ed.), 1992: *Climate System Modeling*, Cambridge University Press.

Class Assignments

Components of Course Grade

10% Problem Sets
20% Class Reports
25% Term Project
10% Quizzes
15% Midterm Exam
20% Final Exam

A few classes present quantitative analysis of climate, for which a total of two homework problem sets will give students practice performing the analysis.

Separate documents will give more details about class reports and the term project.

Class Lecture and Assignment Schedule

See separate document.

Learning Objectives

1. Understand evidence for global warming.
2. Understand physical relationship between changing atmospheric composition and climate parameters such as temperature and rainfall.
3. Understand projections of possible climate futures and the evidence supporting them.
4. Evaluate and explain claims about risks and benefits climate change that are relevant to humans.

Artificial Intelligence (AI) Policy

Homework: Do not use AI (example: chatgpt) to do homework. I do not believe you will learn the material well if the AI does it for you. Also, chatgpt and other chatbots have an annoying tendency to give you an answer whether they found the correct one or not.

As mentioned in **Homework Guide**, please talk to fellow students and/or contact the instructor with any questions about the homework or for hints when you are stuck.

Term Project: Do not use AI (such as chatgpt) to write, outline, or otherwise create your report or your presentation. You may use AI to help you do your literature search for the project. It is sometimes hard to draw a distinction between researching and writing, but the example below should give you the spirit of the difference.

Suppose you are writing a paper on “Variations in the Strength of El Nino”.

You can ask: “Find papers about variations in the strength of El Nino in the peer-reviewed scientific literature.”

You should not ask: “How does the strength of El Nino vary from year to year?”

George Mason University Policies

Please read the GMU guidelines at <https://stearnscenter.gmu.edu/home/gmu-common-course-policies/> for information about

- Academic Standards
- Accommodations for Students with Disabilities
- FERPA and Use of GMU Emails
- Title IX Resources and Required Reporting