

Climate and Global Change

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The learning outcomes for this course are that students understand the physical processes of climate and its sensitivities to forcings and feedbacks, know the history of Earth's climate and natural climate change, and be familiar with the scientific evidence for present-day anthropogenic climate change. This understanding will provide the framework for a term project on the future impacts of climate change, or on methods and policies for mitigation.

Course Materials

These books will help you understand the fundamentals of the Earth system and climate:

The Earth System by L.R. Kump, J.F. Kasting and R.G. Crane, 3rd edition

Earth's Climate: Past and Future by W.F. Ruddiman

These resources will help you understand anthropogenic climate change:

The Rough Guide to Climate Change, Robert Henson, 3rd Edition

SkepticalScience.com <http://www.skepticalscience.com/argument.php>

Intergovernmental Panel on Climate Change (IPCC) Reports, 2013

I Physical Science Basis, Summary for Policymakers and Technical Summary

II Impacts, Adaptation, and Vulnerability, Summary for Policymakers

III Mitigation, Summary for Policymakers

Syllabus

Basics of climate:

- Introduction (1 lecture)
- Components of the Earth System: Atmosphere, Ocean, Cryosphere, & Biosphere (3 lectures)
- Water and carbon cycles, aerosols and pollutants (1 lecture)
- Powering the Earth System: Radiation balance and the "greenhouse effect" (2 lectures)
- How does climate change?: Climate sensitivity and feedbacks (1 lecture)
- Climate Lab: Investigating the greenhouse effect in the laboratory (2 lectures)

Climates of the past:

- How we learn of past climates: Paleoclimate data and models (1 lecture)
- Climate of the last billion years (1 lecture)
- Climate of the last million years: Ice Ages (1 lecture)
- Abrupt climate change: the role of the ocean (1 lecture)
- Climate of the last millennium and impacts on human civilization (1 lecture)

Global warming: Present and future:

- Anthropogenic emissions and sources(1 lecture)

MSC220: Tues/Thurs 11:00-12:15 pm

- Observations of anthropogenic climate change: 2013 IPCC Report (2 lectures)
- Climate modeling: Attribution and future projections: 2013 IPCC Report (1 lecture)
- Discussion: Answering FAQs about climate change (1 lecture)
- Calculating our carbon footprints (1 lecture)
- Political solutions and personal choices (1 lecture)
- Climate impacts: Sea level rise and South Florida (1 lecture)
- Guest lecture, e.g. Climate and ecosystem / human health / economics / geo-engineering)

Course Work and Labs

Coursework consists of an assignment each week and may be reading, homework questions, or an essay. There will be one lab during the semester, completed and written up in groups of up to four students. You will participate in an on-going class room discussion “Climate in the News”, oriented around popular press articles on climate related issues, to be led by a different student each class.

Projects

You will submit a term project, on your own or as a pair, in the form of either (1) A 4-page scientific paper explaining a specific impact of climate change, reading the IPCC Summary Report from WG II plus at least two peer-reviewed articles to research your answers, or (2) A 4-page essay advocating a political or technological solution for mitigating climate change. You will read the IPCC Summary Report from WG III and at least 2 peer-reviewed papers to research your project.

Assessment & Policies

mid-term / final exams	30% / 30%
course work & class participation	20%
projects	20%

Attendance: Attendance is strongly recommended. Students who miss regularly rarely do well in the course work and exams.

Ground Rules: You are expected to come to class prepared to listen and participate. Please respect your fellow students and your professor. Silence your cell phones, so there is no temptation to answer calls or messages during class. If you take notes using a laptop or handheld device, quit your browser, mail tool, and messaging applications so that you can concentrate without distractions.

UM Honor Code: Follow it! Cheating and plagiarism will not be tolerated. Always reference your sources using formal citations.