

This is a full list of the video lectures for the course and an overview of course activities. Greater detail will be provided each week in the Weekly Schedule page, which we will make available and add to the left-hand navigation as we go.

Week 1 / starts Monday, October 21

Our First Climate Model

Video lectures:

- Using Units (2:52)
- Units of Energy (3:27)
- Heat (4:15)
- Units of Light (3:16)
- Light (5:48)
- Blackbody Radiation (6:07)
- Naked Planet Climate Model (8:13)
- The Greenhouse Effect (9:41)

Activities:

- Short Problems on Heat and Energy
- Short Problems on Light
- Solve Your First Climate Model
- (optional) Number Cruncher #1: A Time-Dependent Climate Model
- Weekly Debrief Quiz

Week 2 / starts Monday, October 28

On Greenhouse Gases and the Atmosphere

Video lectures:

- Greenhouse Gas Physics (7:42)
- The Band Saturation Effect (12:41)
- Atmospheric Temperature Structure (8:38)
- Pressure in a Standing Fluid (10:58)
- Water Vapor and Latent Heat (8:30)
- Moist Convection (2:01)

Activities:

- Short Problems on Efficiency of Corn
 - Model Greenhouse Gases in the Atmosphere
 - Model the Lapse Rate and Greenhouse Effect
 - Short Problems on Efficiency of Solar
 - Short Problems on Hoover Dam
 - Weekly Debrief Quiz
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Week 3 / starts Monday, November 4

More on the Atmosphere – and Feedbacks

Video lectures:

- Heat Transport (3:29)
- Coriolis Acceleration (5:25)
- Geostrophic Motion (5:21)
- The Turbulent Cascade (3:27)
- Positive and Negative Feedbacks (4:36)
- Ice Albedo Feedback (2:17)
- Water Vapor Feedback (7:01)
- Clouds (9:15)
- Aerosols (5:48)
- Climate Sensitivity (4:38)

Activities:

- Short Problems on Comparative Energy Prices
 - Model Sunlight, Albedo, and Climate
 - (optional) Number Cruncher #2: The Runaway Ice-Albedo Feedback
 - Two Cloud Models
 - Model Aerosols and Climate
 - Calculate the Climate Sensitivity
 - Introduction of peer-assessed Term Project: Explore Climate Data and Models
 - Weekly Debrief Quiz
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Week 4 / starts Monday, November 11

The Carbon Cycle

Video lectures:

- The Weathering CO₂ Thermostat (8:44)

- The Goldilocks Planets (3:41)
- The Oceans in the Carbon Cycle (5:15)
- The Land Surface in the Carbon Cycle (5:28)
- The Battery of the Biosphere (5:16)
- Oxidation and Reduction of Carbon (6:11)
- Coal (4:20)
- Oil (6:59)
- Natural Gas (2:30)

Activities:

- Model the Global Carbon Cycle
 - Model Ocean / Land CO₂ Uptake
 - Model Intended vs. Greenhouse Yields
 - Model Hubbert's Peak
 - Weekly Debrief Quiz
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Week 5 / starts Monday, November 18

The Perturbed Carbon Cycle

Video lectures:

- Forecasting Future Emissions (3:38)
- Human Impact on the Carbon Cycle (3:12)
- Ocean Buffer Chemistry (6:14)
- The Perturbed Carbon Cycle (2:42)
- Methane as a Greenhouse Gas (8:49)
- The Long CO₂ Tail (5:37)
- Why the CO₂ Tail Matters (6:35)

Activities:

- Model Kaya Identity
 - Model Methane and Slugulator
 - Model the Long Tail
 - Weekly Debrief Quiz
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Week 6 / starts Monday, November 25

The Smoking Gun and Paleoclimate

Video lectures:

- Land Surface Temperature Records (4:15)

- Sea Surface Temperature Records (3:20)
- Satellite Temperature Records (2:26)
- The Smoking Gun: Warming Since the 1970s (6:54)
- Paleoclimate and Proxy Measurements (3:46)
- Tree Rings (4:25)
- Borehole Temperatures (2:48)
- Oxygen Isotopes (4:45)
- Solar Intensity and the Hockey Stick (6:19)
- Glacial - Interglacial Cycles (6:24)

Activities:

- Analyze the Global Meteorological Data
 - (optional) Number Cruncher #3: Climate in the Next Decades
 - Weekly Debrief Quiz
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Week 7 / starts Monday, December 2

Potential Impacts

Video lectures:

- Global Weirding (3:48)
- Monsoons (2:09)
- Vegetation (2:57)
- Impacts of Sea Level (2:01)
- Antarctic Ice Sheet (2:52)
- Greenland Ice Sheet (3:55)
- Paleo Sea Level Changes (2:11)
- Water Vapor and Storminess (1:02)
- Hurricanes (3:14)
- Extreme Weather (1:40)
- Ecosystem Impacts (2:31)
- Human Impacts (1:41)

Activities:

- Explore AR5 Model Results
 - Play with an Ice Sheet Model
 - (optional) Number Cruncher #4: Create a Simple Ice Sheet Flow Model
 - (optional) Number Cruncher #5: Create a Somewhat-less-simple Mountain Glacier Model
 - Weekly Debrief Quiz
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Week 8 / starts Monday, December 9

Mitigation

Video lectures:

- Stabilization Scenarios (2:27)
- Temperature Targets (1:52)
- Slug Theory (5:42)
- Geoengineering: CO₂ Capture and Sequestration (6:47)
- Geoengineering: Solar Radiation Management (3:57)
- Economics of Climate Change (8:50)
- Mitigation: Short-Term (4:18)
- Mitigation: Long-Term (3:55)

Activities:

- Final Debrief Quiz
- Complete peer-assessed Term Project

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Created Mon 25 Feb 2013 5:18 PM PST (UTC -0800)
Last Modified Mon 28 Oct 2013 10:42 AM PDT (UTC -0700)