

ESS 201 The Earth System and Climate

What you can expect to get out of this class.

Different students will take this class for different specific reasons, but the overall goals are:

- to develop a solid understanding of the current “state of the art” in the interdisciplinary field of “Earth System Science”
- to gain new quantitative skills in the earth sciences
- to gain a sense of what the future may hold, and how it may affect you (and how you may affect it)
- to develop the skills to be able to make cogent arguments about the topic of climate change

Format of the class.

Lectures, M and W 8:30 - 9:20 (sorry!), and will provide a step-by-step guide to the various components of the physical Earth system that are important on relatively short (kyr, not Myr) timescales.

Labs on Tu afternoon (1:30 to 3:20) provide an opportunity for in-class problem solving, demonstrations, and discussions based on the weekly assigned reading. *Discussions will be student-led.*

Your responsibilities/grading.

1) Problem sets: 35% of final grade. Short problem set will be assigned each week to help solidify understanding of the solutions to basic calculations important to earth system science. Normally due one week after it is assigned, usually a Thursday.

2) Class presentation/participation: 15% of grade. Student-led discussion sections, based on assigned reading. Two or three students will work together to present the material to the class, in the form of a brief summary (<20 minutes) of the material, and moderation of the discussion.

All students should come to class having read the assigned material and having written down at least two good questions about it. Questions may be requests for clarification of the material (e.g. “could you please explain in more detail what the author means by “photodissociation” in Chapter 5?), or may be questions or statements designed to prompt further discussion (e.g. “I just don’t believe the analogy between the Earth’s climate and a pond covered in lily pads is a good one! How does the author know that climate change is exponential?”). **Bring a copy of your questions** for use in class, and email me (gerard@ess) the questions before hand.

3) Mid-term exam (February 15th), 25% of grade.

4) Final paper (25% of final grade). A final paper (5-8 pages double spaced), written individually, on some topic of earth system science, that evaluates something in more depth than covered in class. Topics should be primarily of a scientific nature, but could include policy. For example a student last year wrote about the options for carbon sequestration – this is a scientific question but requires consideration of economics. Other topics in the past have included: “Should the United States have signed the Kyoto Climate Change treaty?” “The Iris Effect -- a negative feedback on global warming.”

“Does biogenic sulfur affect global cloud cover?” “What explains lower CO₂ during the last glacial maximum?”

Be sure to talk to us about possible subjects early in the quarter.

Textbook (strongly recommended):

Kump, Kasting, Crane. The Earth System 2nd edition, Prentice Hall.

I will put a copy on reserve in the JHN 377 (The Quaternary Research Center Library), and there are copies on reserve in Suzallo, There will be some required reading from this book.

Us:

Gerard Roe, e-mail: gerard@ess.washington.edu
phone: 206-543-4980, office: JHN 361

Nicole Feldl, e-mail: feldl@u.washington.edu
office: JHN 324.

ESS 201 – Syllabus and schedule

Part 1. The physical earth system

Week 1 – January 5th.

Monday – Starting out: what is Earth System Science anyway?

Tuesday (lab) – Fun with numbers

Wednesday – The heat of life: blackbody radiation

Week 2 – January 12th.

Monday – Trapped: the greenhouse effect

Tuesday (lab) - Lab: Radiometric determination of temperature (NF)

Wednesday - Beyond the glass: other controls on surface temperature (NF)

Week 3 – January 19th.

Monday – MLK holiday

Tuesday (lab) – Heat content

Wednesday – Far-out ideas: Daisy world and Gaia

Week 4 – January 26th.

Monday – Spinning envelopes: structure and circulation of the atmosphere

Tuesday (lab) - Ocean circulation in a box

Wednesday – Spinning envelopes: structure and circulation of the ocean

Week 5 – February 2nd.

Monday - The geological regulator: the carbon cycle

Tuesday (lab) Lab: the ocean carbon cycle

Part 2. Changes in climate

Wednesday – The wobbly planet: Milankovitch forcing

Week 6 – February 9th.

Monday – Mammoth changes: the Quaternary ice ages

Tuesday (lab) - Lab: deep-sea sediments and foraminifera

Wednesday – The holly grail: carbon dioxide through the Quaternary

Week 7 – February 16th.

Monday – President’s day holiday

Tuesday – **Midterm(ish) exam**

Wednesday – Icecapades: pre-Quaternary ice ages

Week 8 – February 23rd.

Monday – Wiggles in the mud: millennial scale variability

Tuesday (lab) - Lab: timescales of climate variability

Wednesday – In a blink: rapid climate change

Week 9 - March 2nd.

Monday – The glaciers return: the "little ice age"

Tuesday (lab) - Lab: Modern climate data

Part 3. Our impact on the earth system

Wednesday – Action and reaction: atmospheric chemistry and climate

Week 10 – March 9th.

Monday – Summing it up: climate modeling

Tuesday (lab) - TBA

Wednesday – What on Earth have we done? Recent climate change