

GEOL 150L: Climate Change
Julien Emile-Geay
Spring 2023

General Information

Where/When Class meets Mon/Wed/Fri, 09:00–09:50am in SAL 101
Remember to register separately for lab and class!

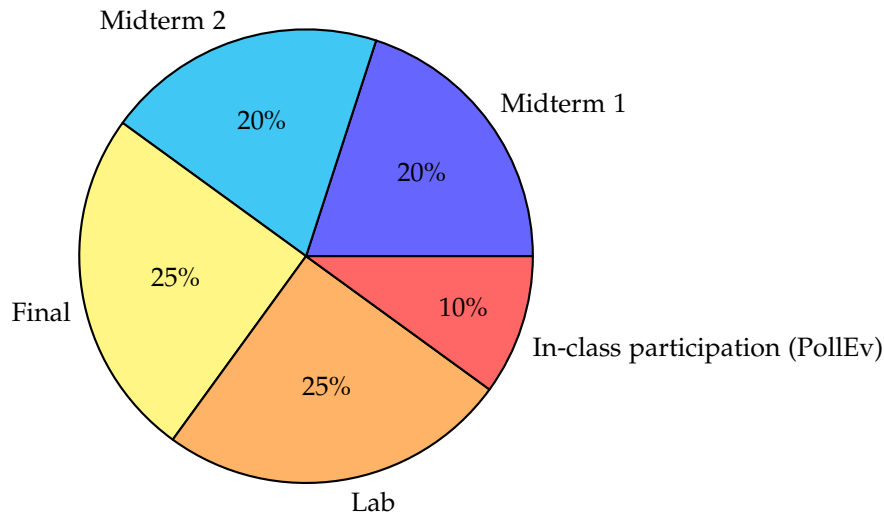
Instructors

Professor:	Julien Emile-Geay	ZHS 275	julieneg@usc.edu
Teaching Assistants:	?		?
	?		?

Office Hours MWF 2-3pm, or by appointment.

Overview

Synopsis This general education undergraduate course will introduce you to the fundamentals of natural and anthropogenic climate change. After briefly recalling the formation of the solar system, our planet and its fluid envelopes, we will introduce the basic physics of the climate system, providing tools to understand climate variability (e.g. monsoons, El Niño), the greenhouse effect, and climate feedbacks. Building on this understanding, a succinct tour of Earth’s history will help us paint a more complete picture of climate variations and how they interacted with human history. We will highlight the anomalous character of recent climate change, establish its anthropogenic nature, discuss the root causes of this crisis, and potential solutions.



Grade

The class is worth 4 units, which means that it requires substantial work. Lab attendance is mandatory every week. Labs are graded weekly and administered by Teaching Assistants (see separate lab syllabus). Exams are all multiple choice questions. The final (2h) is cumulative. Exam grades are curved so that the best score gets 100; everyone else is graded down from there. So if the test was hard and the best grade was 91, everyone else’s grade gets shifted upward by 9 points. Further adjustments are non-negotiable. Haggling would only have negative impacts on your grade (of course, you are too smart to resort to such vile tactics anyway). The numeric to letter grade conversion is shown in Table 1.

Table 1: Numeric to letter grade conversion (cutoffs)

< 60	60	63	67	70	73	77	80	83	87	90	≥ 93
F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A

Extra credit One way to boost your grade is participating in the [Joint Educational Project](#), worth up to 1/3 of a grade (3.33%) (e.g. from B+ to A-). Sign up early or forever hold your peace. I do not offer other extra-credit opportunities.

Rules There aren't many rules, but they're all important. First, read the syllabus (if you've gotten this far, you're on the right track). Second, check BlackBoard. Third, ask questions when you don't understand things; chances are you're not alone. Fourth, don't miss class or lab. Fifth, please do not email the instructor with questions whose answer is in the syllabus. Sixth, under no circumstance should you ever even think of haggling for your grade. Seven, read the syllabus once more. Just in case.

Exams This semester exams will be administered through Blackboard, which is also where announcements will appear. The final is cumulative, but the midterms are not.

Blackboard exams will occur in a narrow time window (class time), but students participating from time zones other than PST will have the possibility of taking the exam at other times (arrangements should be made with the TAs a week before each exam).

Participation

Participation is an essential element of active learning. This class offers various opportunities for active learning, both synchronous and asynchronous. If you attend lectures (and manage to stave off distractions during them) you're ahead of the curve. If you participate during said lectures, you're doing great. In-class polls, administered through [Poll Everywhere](#) are another way to participate. Note that this way is also available asynchronously, as polls stay open for 24h.

Reading

Main book (optional)

Dessler, A., *Introduction to Modern Climate Change, 3rd Ed.*, Cambridge University Press, 2021. [URL](#).

Weekly readings

Will be either taken from the book or posted on [BlackBoard](#).

Relevant Books

- Weart, S., *The Discovery of Global Warming*, [URL](#).
- Emanuel, K., *What we know about climate change*, [URL](#).
- Diamond, J., *Collapse: How Societies Choose to Fail or Succeed*, [URL](#).
- Davis, M., *Late Victorian Holocausts: El Niño Famines and the Making of the Third World*, [URL](#)

Schedule

I HOW CLIMATE WORKS

The first section of the class focuses on the climate system, what it is and how it works.

Week 1 — 01/09/23— Setting the stage

Monday: The Discovery of Global Warming

Wednesday: Cosmic History

Friday: Climate components

Suggested reading: Dessler, Chapter 1 & 2

Week 2 — 01/16/23— Energy & Radiation

Monday: NO CLASS (Dr Martin Luther King Jr day)

Wednesday: Energy types & conversions

Friday: Radiation, heat and temperature

Suggested reading: Dessler, Chapter 3

Week 3 — 01/23/23— Planetary Energy Balance

Monday: The greenhouse effect

Wednesday: Insolation and the seasons

Friday: Water in the atmosphere

Lab #1: Energy Balance

Suggested reading: Dessler, Chapter 4.

Week 4 — 01/30/23— Atmospheric Motion

Monday: The General Atmospheric Circulation

Wednesday: The Physics of Rain

Friday: Tropical Cyclones: Hurricanes and Typhoons.

Lab #2: Greenhouse Gases

Week 5 — 02/06/23— Oceans & Climate

Monday: Earth's Oceans

Wednesday: Ocean Circulation and climate

Friday: Forcings & Feedbacks. Seasons and Monsoons

Lab #3: Atmospheric Circulation

Suggested reading: R.Seager: *Is the Gulf Stream responsible for Europe's mild winters?*. Dessler, Chapter 6.

Week 6 — 02/13/23— Carbon Cycle

Monday: The (short-term) Carbon Cycle

Wednesday: The (long-term) Carbon Cycle

Friday: Carbon Cycle Malfunctions

Lab #4: The Carbon Cycle, Part 1

Suggested reading: Dessler, Chap 5.

Week 7 — 02/20/23— Midterm

Monday: NO CLASS (President's day)

Wednesday: Midterm review

Friday: Midterm 1

Lab #5: The Carbon Cycle, Part 2

Suggested reading: Dessler, Chap 1 – 6.

Week 8 — 02/27/23— Climate Variability

Monday: El Niño– dynamics and impacts

Wednesday: Droughts and the Dust Bowl

Friday: Paleoclimatology: the science of Past Climates

Lab #6: Climate Variability.

Suggested reading: Dessler, Chapter 7.

II HISTORY OF CLIMATE, HISTORY AND CLIMATE

The section focuses on how the climate system has behaved over the course of Earth's history. This history is rich in lessons about climate's future, and our own.

Week 9 — 03/06/23— Ice Ages

Monday: Pleistocene Ice Ages: observations

Wednesday: Pleistocene Ice Ages: astronomical theory

Friday: Icehouse vs Hothouse

Lab #7: The astronomical theory of Ice Ages

Suggested reading: Davis: *El Niño famines*. Dessler, Chapter 7

SPRING RECESS : March 12 – 19

Week 10 — 03/20/23— Climate Surprises

Monday: Abrupt climate change

Wednesday: Societal collapse & climate change

Friday: Midterm 2

Lab #8: Extremes in Context

Suggested reading: *E.Kolbert, the climate of man, part 2*. Dessler, Chapter 5.

III THE CLIMATE OF MAN

Week 11 — 03/27/23— The Anthropocene

Monday: The Anthropocene

Wednesday: Taking Earth's temperature

Friday: The climate data patchwork

Suggested reading: Kerry Emanuel: Phaeton's Reins.

Lab #9: The Temperature Record

Week 12 — 04/03/23— Climate Models

Monday: Climate Models I: Early pioneers

Wednesday: Climate Models II: General Circulation Models

Friday: Climate Models III: attributing climate change.

Suggested reading: *Schmidt: the physics that we know*. Dessler, Chapter 8

Week 13 — 04/10/23— Climate Futures

Monday: The Greenhouse Future

Wednesday: Climate Impacts

Friday: The Economics of Climate Change

Lab #10: The attribution of Climate Change

Suggested reading: Dessler, Chap 8, 9, 10. Hoffman, 2012: *Climate Science as Culture War*

Week 14 — 04/17/23— Climate Denial

Monday: The American Denial of Global Warming

Wednesday: Merchants of Doubt

Friday: Climate Psychology

Suggested reading: Dessler, Chapter 10, 11, 12.

Lab #11: How to talk to a climate contrarian

Suggested reading: Dessler, Chap 13. *Oreskes & Conway, The Collapse of Western Civilization*

Week 15 — 04/24/23— Climate Decisions

Monday: Climate Options

Wednesday: Geoengineering

Friday: Climate Policy

Suggested reading: Dessler, Chapter 11, 12, 14. *Climate engineering reconsidered*.

Friday May 5—Final Exam – 8-10am

IV PARTICIPATION

Class participation is a critical aspect of this course. It takes place in two main avenues : in lectures and on **BlackBoard**. The first way to participate in class is to come to class. I somehow make it to class every day – it requires no superhuman powers. However, just parking in the classroom and checking Facebook is a waste of your time and your parents' money, so *active participation* is what we're after: ask questions. Offer comments. You're not required to know much science to take this class, so there is no such thing as a stupid question; also, we will encounter many controversial topics, in which your opinion matters – it would be too bad to keep it for yourself. In-class participation represents 10% of the final grade (i.e. half the final). That is no small potatoes. Treat it seriously. To obtain these 10 points, you need to maintain an average participation rate of at least 80% by the end of the term (excused absences are OK, of course).

V TECHNOLOGY

Blackboard

BlackBoard is our primary medium of communication outside the classroom. It is where I post class notes, announcements, and assignments. It is where you access that content, participate in discussions, and check your grades. **It is your responsibility to ensure that you receive BlackBoard announcements.** Make sure you enable email notifications, and importantly, make sure your inbox is not full; every year I get emails bounced from students too neglectful to clean up their inbox. If you have a doubt about when an assignment is due, go check it on BlackBoard. Also note that BlackBoard messages are richer than the email notifications they generate. Frequently, the announcements I'll send will have links to content archived on BlackBoard – those links will not appear in the emails. If the email digest you read does not make sense, please check it on BlackBoard; it might have the answer you need over there. If it still doesn't, please email me.

Poll Everywhere

The tool we will use to gather live, in-class feedback is called **Poll Everywhere**. You may submit your responses in one of three ways: Text messages, a Smartphone App, or a Web browser. Dornsife College will support all costs of this platform; signup details to follow.

Email

Email is a relatively new advent in the world of education. It allows an unparalleled level of access to professors, which has both pros and cons. In some cases you will spot a mistake of mine in an assignment or a grade, and pointing it out will save everyone a lot of time. In many cases, however, emails unnecessary clog my inbox. Here are some rules to use email wisely:

- Check BlackBoard before you type. Chances are the answer to your question is already there.
- Direct all lab-related queries to your TA.
- Don't expect an immediate answer. Chances are, I'm not reading my email at 4am.
- Write exactly as if you were speaking to me in person. Not more, not less formally. Other email etiquette tips may be found [here](#).

VI ACADEMIC CONDUCT

Most likely you are a responsible adult, so the comments below don't apply to you. However, for the small minority of childish students who insist on ruining the experience for their peers, here are a few admonitions for good measure.

Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [USC Student Handbook](#) or the [Office of Academic Integrity's](#) website, and university policies on [Research and Scholarship Misconduct](#).

Plagiarism

Presenting someone else's ideas as your own, either verbatim or recast in your own words, is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in [SCampus](#) in Section 11, [Behavior Violating University Standards](#). Other forms of academic dishonesty are equally unacceptable. See [additional information in SCampus](#) and university policies on scientific misconduct.

Discrimination

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the [Office of Equity and Diversity](#) or to the [Department of Public Safety](#). This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. The [Relationship and Sexual Violence Prevention and Services](#) provides 24/7 confidential support, and the [sexual assault resource center webpage](#) describes reporting options and other resources.

Support Systems

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the [American Language Institute](#), which sponsors courses and workshops specifically for international graduate students. The [Office of Disability Services and Programs](#) for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, [USC Emergency Information](#) will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

Past Tests

We are aware that some former tests from this class are available on the web, and remind you that we change the exams from year to year. However, using canned answers from past exams is a really good way of helping us catch lazy cheaters, so we encourage their use to make our life easier!

GradeBuddy

The following is a reminder from Academic Policies memo 11/25:

Any student selling or distributing notes taken in a classroom is in violation of the University's Academic Integrity policy and is subject to university sanctions. This policy is clearly stated in Section 11.12 of the student handbook, [SCampus](#), which identifies the following as violations of community standards:

- Acquisition of term papers or other assignments from any source and the subsequent presentation of those materials as the student's own work, or providing term papers or assignments that another student submits as his/her own work.*
- Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes, but is not limited to, providing materials for distribution by services publishing class notes. This restriction on unauthorized use also applies to all information which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the Internet or via any other media. (See Section C.1 Class Notes Policy.)*
- Recording a university class without the express permission of the instructor and announcement to the class. Recording can inhibit future free discussion and thus infringe on the academic freedom of other students as well as the instructor.*