

# Geography 40: Introduction to Earth System Science

Spring 2023 Syllabus (version date 01/17/23)

**Lecture:** Monday/Wednesday 9:30am-11:00am Pacific Time in McCone 575

**Lab (one section/week):**

*There is an optional section on the week of January 23 to review key math and science concepts.*

*The first mandatory section starts on the week of January 30<sup>th</sup>.*

(101) Monday 12:00pm-2:00pm, McCone 535

(102) Tuesday 12:00pm-2:00pm, McCone 535

**Lecture Instructor:**

John Chiang ([jch\\_chiang@berkeley.edu](mailto:jch_chiang@berkeley.edu)).

Office hrs: TBA @ 547 McCone Hall (when online: <https://berkeley.zoom.us/j/2635155989>); or by appointment

**Lab Instructor:**

Roland Theiss ([christophertheiss@berkeley.edu](mailto:christophertheiss@berkeley.edu)).

Office hrs: Thursdays 10-11a @ TBA (when online: <https://berkeley.zoom.us/j/6502480516>); or by appointment

**Course description:**

This first course in physical geography lays out the scientific understanding of global changes to the Earth system. All the Earth's components - the atmosphere, hydrosphere, biosphere, cryosphere, and lithosphere – are treated as an interactive whole to understand global environmental change. In the first half of the course, we will cover the various components to the earth system. Documenting the occurrences and understanding the causes of past global changes gives us a perspective and baseline for understanding the potential for the earth system to change. In the second half of the course, we will look at various cases of past global changes. Humans have been significantly changing the global environment over the last 100 years, and we will look at the problem of global warming in depth. *Course meets the L&S Physical Science and Biological Science Breadth Requirements*

**Course website:**

Most course materials posted on bCourses (<https://bcourses.berkeley.edu>). We will also use Gradescope (<https://www.gradescope.com/>) to post online assignments (more information below) and you will upload completed labs and assignments to this site.

**Required Text:**

*The Earth System* by L.R. Kump, J. F. Kasting, and R.G. Crane (3rd ed., 2010) [abbreviated as KKC].

This textbook is available as [a scan through the UC Berkeley library](#) [must log in to view it; cannot be downloaded]. The international edition is also acceptable, though the page numbers are different, and you are responsible for making sure you are reading the correct section. If you require a downloadable PDF of the textbook with text recognition for accessibility or other reasons, please contact the instructor. Additional short readings will be provided as PDFs on bCourses and are also linked in the schedule below.

### Grading breakdown (weights subject to change):

Weekly Online Assignment	up to 10%**	11 assignments, 1% each, lowest one dropped
Lab assignments	35%^	11 labs, 3.5% each, lowest one dropped
Lab participation	5%	See <a href="#">rubric</a> for more details
Midterm	20%+**	Wednesday March 15, in class
Final Exam	30%+**	Monday May 8, time and venue TBA

- \*\* Online assignments will be released by noon on Wednesdays and due by 9:30am on the following Monday. If you miss more than one online assignment, the points for the missed assignment will be replaced with either your midterm or final scores, depending on which exam the online assignment material is covered. For example, if you miss online assignments 2 and 3, the midterm will be weighed at 21% and your online assignments will be weighed at 9%.
- ^ Lab assignments will be released by noon on Monday (if not before) and will be due at 11:59am on the following Monday (i.e. you have 1 week to complete it). Requests for an extension must be submitted to your lab instructor via email at least 2 days before the assignment is due. Please submit labs on gradescope either by uploading PDFs of a Word file or Google doc, or uploading clear images of your handwritten labs.
- Both midterm and final exams will be in person, and closed note and closed book

### Grading policy:

- No late online assignments will be accepted. If you miss an assignment, the points will be made up from exams instead.
- Late labs will be deducted by 10% per day, up to a maximum of 4 days. Late labs will not be accepted after that point.
- You may request a regrade of a given question through gradescope up to a week after the assignment or exam has been graded and returned to you. The GSI will only regrade a question if an error was made in applying the rubric; we will not make any adjustments to the rubric itself.

### Course expectations:

- Attendance in the lab is mandatory. If you have an extenuating circumstance, please contact the lecturer and your lab instructor within the first week of class to discuss alternative arrangements.
- Please do not come to lecture or lab if you are feeling ill or are positive for COVID-19. Contact your lab instructor as soon as possible to make alternate arrangements. You will not be penalized for missing lab due to illness or quarantining.
- You must take both the midterm and final exams to pass the course.
- Please check bCourses regularly for assignments and reading material.
- This class is based on participation. Asking questions, collaborating with classmates, and staying on top of readings and assignments is key.
- You must adhere to all academic integrity policies, [as outlined by the University](#). Please also see the heading under 'Academic Integrity' on the last page of the syllabus.

**Academic Accommodations:** The purpose of academic accommodations is to ensure that all students have a fair chance at academic success. If you have Letters of Accommodations from the Disabled Students' Program or another authorized office, please share them with the instructors as soon as possible, and we will work out the necessary arrangements. While individual circumstances can vary, requests for accommodations often fall into the categories listed on the Academic Calendar and Accommodations website. The campus has well-developed processes in place for students to request accommodations, and you are encouraged to contact the relevant campus offices listed on the [Academic Accommodations Hub](#). These offices, some of which are confidential, can offer support, answer questions about your eligibility and rights, and request accommodations on your behalf, while maintaining your privacy.

**Resources and Support:** The teaching team understands that the pandemic and other global events may have the potential to significantly impact your experiences this semester. Our goal is to be as understanding and flexible as possible considering those circumstances while still maintaining academic integrity and meeting our student learning outcomes. If you find yourself struggling with the course material or have extenuating circumstances impacting your ability to complete the course, please reach out as soon as possible and we will work with you to find a feasible accommodation or provide additional support. You may also find it helpful to utilize the following campus resources:

- Counseling and Psychological Services | <https://uhs.berkeley.edu/caps>
- Student Learning Center | <https://slc.berkeley.edu/>
- Disabled Students' Program | <https://dsp.berkeley.edu/>
- COVID-19 Resources Hub | <https://coronavirus.berkeley.edu/>

#### **4 questions about *Introduction to Earth System Science***

##### **1. What is Earth System Science?**

*Earth System Science is an interdisciplinary field that describes the cycling of energy and matter between the different spheres (atmosphere, hydrosphere, biosphere, cryosphere, and lithosphere) of the earth system.*

##### **2. What are some typical Earth System Science problems?**

*We will learn about how the atmosphere, oceans and lithospheric plates move; about the history of life and climate on our planet; and about modern issues of climate change, stratospheric ozone depletion, and biodiversity loss.*

##### **3. Why take a 'systems' approach?**

*The earth's spheres interact with each other in an inextricably linked system to allow our planet to be habitable. Earth's history is the key to understanding its present and future, and in order to understand the impact of humans on the earth, we need to understand how the earth itself functions as a system.*

##### **4. Are there pre-requisites for this class?**

*This class is a survey of earth system science, and it will involve chemistry, math, biology and physics. However, there are no prerequisites other than algebra, diligence, and an inquisitive nature.*

## Geography 40 Schedule (subject to change)

Week	Mon lecture	Wed lecture	Online Assign	Lab assignment	Reading
<b>1</b> <b>(1/16)</b>		1.Introduction			1. KKC 1-13
<b>2</b> <b>(1/23)</b>	2.Daisyworld: an introduction to systems	3.Planetary Energy Balance 1	#1	0. Review of math and science concepts	2. KKC 21-33 3. KKC 36-44
<b>3</b> <b>(1/30)</b>	4.Planetary Energy Balance 2	5.Atmospheric composition and vertical structure	#2	1. Feedbacks	4. KKC 36-44 5. KKC 44-50, 57-60
<b>4</b> <b>(2/6)</b>	6.Water in the atmosphere and climate	7. Atmospheric circulation 1	#3	2. Energy balance and the greenhouse effect	6. EG 145-171, KKC 50-55 7. KKC 57-68
<b>5</b> <b>(2/13)</b>	8. Atmospheric circulation 2	9. Ocean circulation 1	#4	3. Greenhouse gases, atmospheric vertical structure	8. KKC 68-82 9. KKC 84-92, 157-159
<b>6</b> <b>(2/20)</b>	Academic holiday - No class	10. Ocean circulation 2	#5	4. Atmosphere	10. KKC 96-107, KKC 117-120; Kerr (2012)
<b>7</b> <b>(2/27)</b>	11. ENSO	12. California	#6	5. Ocean circulation	11. KKC 92-96, Fountain (2016) 12. TBA
<b>8</b> <b>(3/6)</b>	13. Earthquakes	14. Plate tectonics	#7	6. ENSO and regional climate	13. EnvG Ch3, KKC 122-130 14. KKC 130-144
<b>9</b> <b>(3/13)</b>	15. Midterm review	Midterm		Review	
<b>10</b> <b>(3/20)</b>	16. Cryosphere and sea level rise	17. TBA	#8	7. Earthquakes and Plate tectonics	16. KKC 108-117 17. TBA
<b>11</b> <b>(3/27)</b>	Spring break - No class	Spring break - No class		No lab this week	
<b>12</b> <b>(4/3)</b>	18. Pleistocene glaciations	19. Abrupt climate change	#9	8. Global warming discussion	18. KKC 272-281 19. KKC 272-281, Alley (2004)
<b>13</b> <b>(4/10)</b>	20. Carbon cycle 1	21. Carbon cycle 2	#10	9. Pleistocene Glaciations and abrupt change	20. KKC 149-162 21. KKC 162-164, KKC 303-309, Ruttiman (2006)
<b>14</b> <b>(4/17)</b>	22. Global warming 1	23. Global warming 2	#11	10. Carbon cycle	22. TBA 23. TBA
<b>15</b> <b>(4/24)</b>	24. Global Warming 3	25. Final Review		11. Global Warming	24. TBA
<b>16</b> <b>(5/1)</b>	RRR Week				
<b>17</b> <b>(5/8)</b>	Final Exam on Monday May 8				

KKC = Kump, Kastings and Crane, The Earth System (textbook)

EG = Christopherson, Elemental Geosystems (PDF of the readings will be provided)

EnvG = Montgomery, Environmental Geology (PDF of the readings will be provided)

### **Academic Integrity**

Please read the statements below on our expectations of you. They are taken from the *Berkeley Center for Teaching and Learning* (<https://teaching.berkeley.edu/statements-course-policies>)

“You are a member of an academic community at one of the world’s leading research universities. Universities like Berkeley create knowledge that has a lasting impact in the world of ideas and on the lives of others; such knowledge can come from an undergraduate paper as well as the lab of an internationally known professor. One of the most important values of an academic community is the balance between the free flow of ideas and the respect for the intellectual property of others. Researchers don’t use one another’s research without permission; scholars and students always use proper citations in papers; professors may not circulate or publish student papers without the writer’s permission; and students may not circulate or post materials (handouts, exams, syllabi--any class materials) from their classes without the written permission of the instructor.”

“Any test, paper or report submitted by you and that bears your name is presumed to be your own original work that has not previously been submitted for credit in another course unless you obtain prior written approval to do so from your instructor. In all of your assignments, including your homework or drafts of papers, you may use words or ideas written by other individuals in publications, web sites, or other sources, but only with proper attribution. If you are not clear about the expectations for completing an assignment or taking a test or examination, be sure to seek clarification from your instructor or GSI beforehand. Finally, you should keep in mind that as a member of the campus community, you are expected to demonstrate integrity in all of your academic endeavors and will be evaluated on your own merits. The consequences of cheating and academic dishonesty—including a formal discipline file, possible loss of future internship, scholarship, or employment opportunities, and denial of admission to graduate school—are simply not worth it.”

**"Collaboration and Independence:** Reviewing lecture and reading materials and studying for exams can be enjoyable and enriching things to do together with one’s fellow students. We recommend this. However, homework assignments should be completed independently and materials turned in as homework should be the result of one’s own independent work. Some assignments, namely the preparation for the debate arguments, are meant to be done together in a group.”

**“Cheating:** Anyone caught cheating on a quiz or exam will receive a failing grade and will also be reported to the University Office of Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.”