ESM 203 - Earth System Science
Fall, 2021

Meeting Location: Marine Science Building (MSI), Room 1302

Instructors
Kelly Caylor, Bren 4508/Ellison 6812, caylor@ucsb.edu
Samantha Stevenson, Bren 3412, sstevenson@ucsb.edu

Instructor Office Hours:
Caylor: Monday evenings, 4-6pm
Stevenson: 11am-1pm Tuesday

Teaching Assistants
Anna Boser, annaboser@bren.ucsb.edu
Office Hours: Wednesday, 3-4PM & 5-6PM PST, or by appointment
Rachel Torres, ratorres@bren.ucsb.edu
Office Hours: Tuesdays, 12-2PM PST, or by appointment

Course objectives
- To provide a foundation in the tools and terminology of system science, their application to Earth’s systems, their utility in environmental problem solving, and their relevance to successful environmental management.
- To be able to apply principles of mass, energy, and momentum balance to understand the dynamics of the Earth’s biosphere, atmosphere, and hydrosphere.
- To be able to explain the critical observations and methods that provide the basis for our empirical understanding of global change and Earth system dynamics.
- To have a working capacity and familiarity with basics of environmental physics, including important principles of radiative transfer, fluid dynamics, and heat flow.
- To understand the drivers of local and regional atmospheric dynamics.
- To be able to describe the flow of mass and heat within the ocean and their importance to global and regional climates.
- To be able to describe the energy, carbon, and water balance of landscapes, and their dependence on land surface properties.

Course expectations
During our first meeting, we will define a set of expectations as students and instructors.
Our goal as instructors in this class is to provide each of you with the experiences and information necessary to gain the requisite understanding, experience, and confidence necessary to allow you to analyze realistic environmental management problems through the perspective of system science. Our hope is that you will repeatedly fall back on Earth System Science content knowledge and especially an Earth System Science “way of thinking” as you confront and manage complex environmental issues throughout your professional lives.

Course Content Areas

- Earth System Science Principles
- Planetary and Surface Energy Balance
- Atmospheric and Oceanic Circulation
- Hydrological Processes and Water Management
- Carbon Cycle and Human Energy Use
- Climate Dynamics, Climate Models, and Climate Change

An up-to-date detailed schedule of topics and assignments (subject to changes) is [here](#).

Skill Areas

- Application of physical and chemical principles to understanding global, regional, or local-scale physical processes, including the influence of human activity.
- Understanding the degrees to which predictive capability exists and evolves.
- Practice in analyzing the system science principles underlying environmental management problems, such as climate change, water supply, mining, and soil erosion.
- A capacity to use models and interpret their results - as well as their accompanying uncertainty - to analyze environmental problems quantitatively.
- The ability to write brief, cogent assessments of a state-of-knowledge related to Earth System Sciences.
Course Assessment

Your performance in this course will be evaluated based on your participation in/completion of discussion section activities/class assignments as well as four homeworks, a mid-term, and a final exam.

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<thead>
<tr>
<th>Component</th>
<th>% of Total</th>
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<tbody>
<tr>
<td>Discussion Section &amp; Pre-class Assignments</td>
<td>20%</td>
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<tr>
<td>Homeworks (4)</td>
<td>10% each, 40% total</td>
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<tr>
<td>Mid-term</td>
<td>20%</td>
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<tr>
<td>Final</td>
<td>20%</td>
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<tr>
<td>Gauchospace Forum*</td>
<td>5%</td>
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*extra credit! See FAQ on Forum site for details

Note on late assignments: This is a professional degree program, and we expect you to meet your deadlines. Of course, we also understand that we are in exceptional circumstances, and things come up - if you anticipate having trouble meeting deadlines, please let us know as soon as you can, and we'll do our best to accommodate all reasonable requests.

Pre-class assignments are expected to be completed prior to the start of the corresponding synchronous meeting for full credit; completing the assignments later will be possible but result in partial credit.

Homeworks are expected to be completed prior to the assigned due date for full credit. Late assignments will be marked down ⅔ letter grade each day (i.e. 2-day late A- work will receive a C+)