

ESM 203 - Earth System Science

Fall, 2018

Instructors

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Instructor Office Hours: Whenever the door is open, or email to make an appointment.

Teaching Assistants

Christopher Heckman, Bren 1005, checkman@bren.ucsb.edu

Office Hours: Tuesday, 1-4

Rachel Torres, Bren 1005, ratorres@bren.ucsb.edu

Office Hours: Wednesday, 12-3

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.

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

A detailed schedule of lectures (subject to changes) is provided at the end of this document, and on the course's Gauchospace site.

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 four assignments, a mid-term, a final exam, and your participation in/completion of discussion section activities.

Component	% of Total
Mid-Term	25%
Final	25%
Assignments (4)	10% each, 40% total
Discussion Section	10%

Note: This is a professional degree program, and we expect you to meet your deadlines. **Late assignments will be marked down $\frac{2}{3}$ letter grade each day** (i.e. 2-day late A- work will receive a C+)

Course Schedule

Day of the Week	Date	Lecture
Thursday	9/27/2018	Systems Science
Tuesday	10/2/2018	Systems Science
Thursday	10/4/2018	System Science: Energy Balance
Tuesday	10/9/2018	System Science: Energy Balance
Thursday	10/11/2018	Atmospheric/Ocean circulation
Friday	10/12/2018	ASSIGNMENT #1 DUE
Tuesday	10/16/2018	Atmospheric/Ocean circulation
Thursday	10/18/2018	Atmospheric/Ocean circulation
Tuesday	10/23/2018	Atmospheric/Ocean circulation
Thursday	10/25/2018	Hydrology
Friday	10/26/18	ASSIGNMENT #2 DUE
Tuesday	10/30/2018	Hydrology
Thursday	11/1/2018	Hydrology - Water Resources
Tuesday	11/6/2018	MID TERM
Thursday	11/8/2018	Hydrology - Water Resources
Tuesday	11/13/2018	Carbon Cycle
Thursday	11/15/2018	Carbon Cycle
Friday	11/16/18	ASSIGNMENT #3 DUE
Tuesday	11/20/2018	Carbon Cycle
Thursday	11/22/2018	THANKSGIVING
Tuesday	11/27/2018	Climate Change
Thursday	11/29/2018	Climate Change
Tuesday	12/4/2018	Climate Change
Thursday	12/6/2018	"Students' choice" lecture
Friday	12/7/2018	ASSIGNMENT #4 DUE

