

**Earth System Science 200: Global Physical Climatology (Fall 2022)**  
**(<http://www.ess.uci.edu/~yu/ess200.html>)**

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Tuesdays & Thursdays 9:30-10:50am, RH190

**COURSE DESCRIPTION**

This course builds a physical understanding of Earth's climate system. An overview of Earth's climate system and energy budget. Large-scale circulations, key physical processes, and climate sensitivity of the atmosphere, ocean, land surface, and cryosphere.

**TEXTBOOKS**

Global Physical Climatology (2nd Edition), by Dennis Hartmann, Elsevier Inc. **(required)**  
The Earth System (3rd Edition), by Kump et al., Prentice Hall **(optional)**  
Meteorology Today (11th Edition), by Donald Ahrens, Brooks/Cole **(optional)**

**GRADES**

Homework (30%); midterm (35%); Final (35%)

**HOMEWORKS**

Issue and due every Thursday

**SYLLABUS**

Week 0	09/22	<b>Introduction to the Climate System</b> (Ch.1) Atmospheric properties and structures World Ocean, land surface, and cryosphere
Week 1	09/27 & 09/29	<b>The Global Energy Balance</b> (Ch.2) Planetary energy balance, greenhouse effect Global radiative energy balance, poleward energy flux
Week 2	10/04 & 10/06	<b>Atmospheric Radiative Transfer and Climate</b> (Ch.3) Solar and infrared radiation, selective absorption and emission Cloud and radiation, radiative-convective equilibrium
Week 3	10/11 & 10/13	<b>The Energy Balance of the Surface</b> (Ch.4) Surface Properties, Storage, Heating, Albedo, Emission Planetary boundary layer, drag, mixing, fluxes
Week 4	10/18 & 10/20	<b>Atmospheric General Circulation and Climate</b> (Ch.6) Zonal-mean circulation, eddies Angular momentum, moist static energy
Week 5	10/25 & 10/27	<b>The Ocean General Circulation and Climate</b> (Ch.7) Ocean properties and structures, water mass Wind-driven circulation, thermohaline circulation, and transports
Week 6	11/01 & 11/03	<b>cont. (Ch.7) &amp; Midterm</b>
Week 7	11/08 & 11/10	<b>Cryosphere</b> (Kump et al. 2016; Ch. 6) Glaciers, ice sheets, mass balance, sea-Level
Week 8	11/15 & 11/17	<b>Natural Intraseasonal and Interannual Variability</b> (Ch.8) Internal atmospheric variability, El Niño and the southern oscillation, Decadal variations of weather and climate
Week 9	11/22 & <b>11/24</b> (Holiday)	<b>Climate Sensitivity and Feedback Mechanisms</b> (Ch.10) Sensitivity and feedback Water vapor, ice-albedo, cloud, dynamical
Week 10	11/29 & 12/1	<b>Natural Climate Change</b> (Ch.12) Natural solar, aerosol, volcanic forcing Past climate changes
<b>Final</b>	<b>TBD</b>	