

SYLLABUS Fall 2021

Physical Basis of Global Warming SIO 117

Instructor: Ralph Keeling (rkeeling@ucsd.edu)
 Teaching Assistant: Veronica Berta (vberta@ucsd.edu)

Lecture: MWF 1:00-1:50 p.m. PCYNH 120 Discussion (not every week, TBD): Fri. 2:00-2:50 PCYNH 120
 Zoom Office Hours: Tuesdays, 3:30-5:00 (Keeling), Thursdays, 11:30-1:00 (Veronica).

Course Prerequisites: Math 20D and Phys. 2C or consent of instructor

Relevant Texts: David Archer, Global Warming, Understanding the Forecast, Blackwell, 2007 or Wiley 2012 (2nd Edition)
 David Neelin, Climate Change and Climate Modeling, Cambridge University Press 2011

Course material downloads, including lecture notes and problem sets on Canvas
 Problem Sets will be given out roughly weekly, typically due on Wed.

Grading: Problem Sets 25%, Midterm 25%, Final 50%

Week	Due	Titles	Reading, required and (recommended)
1.	1 Sep 24	1. Introduction PS1	(Neelin, 1.1-1.4,1.6)
	Sep 27	2. Elements of climate system	Archer 1, Neelin 2.1, 2.4, 2.5.1, 2.6
	Sep 29 PS1	3. Planetary energy balance PS2	Archer 2, 3 (Neelin 2.2-2.3)
2.	Oct 1	4. Molecular Structure, IR spectra	Archer 4
	Oct 4	5. Radiative transfer	
	Oct 6 PS2	5. – continued PS3	
3.	Oct 6	6. Vertical structure, hydrostatic balance, etc.	Archer 5 (Neelin 3.1.5, 3.2, 3.3)
	Oct 11	7. Vertical transport and convection	Archer 5 (Neelin, 2.3, 3.5, 3.6, 5.3.2, 5.3.3)
	Oct 13 PS3	7. – continued PS4	
4.	Oct 15	8. Horizontal momentum equation	Archer 6, Neelin 3.1, 3.2, 3.3, 3.4.4
	Oct 18	9. Thermal wind, baroclinic instability	
	Oct 20 PS4	9. – continued PS5	
5.	Oct 22	10. Climate models	Neelin 5.1, 5.4-5.6
	Oct 25	10. continued	
	Oct 27 PS5	11. Refinements to layer model PS6	Neelin 6.1-6.2 (Archer 3)
6.	Oct 29	11. – continued	
	Nov 1	MIDTERM	
	Nov 3	12. Climate sensitivity and radiative forcing	Neelin 6.1-6.2
7.	Nov 5 PS6	13. Climate feedbacks PS7	Archer 7, Neelin 6.3-6.7
	Nov 8	13. – continued	
	Nov 10	14. Transient climate response	Neelin 6.8
	Nov 11	VETERANS DAY	
8.	Nov 12 PS7	14. – continued PS8	
	Nov 15	15. Greenhouse gas controls	Archer 10
	Nov 17	16. The carbon cycle and CO ₂ PS9	Archer 8 (Neelin 2.8)
9.	Nov 19	16. – continued	
	Nov 22 PS8	17. Observed climate changes	Archer 11 (Neelin 7.6)
	Nov 24	CLASS CANCELED	
10.	Nov 26	THANKSGIVING HOLIDAY	
	Nov 29 PS9	17. – continued	
	Dec 1	18. Model projections and consequences	Archer 12 (Neelin 7.7)
11.	Dec 3	18. – continued	
	Dec 6	FINAL EXAM 11:30-2:59 pm Location TBA	