SYLLABUS Fall 2023 **Physical Basis of Global Warming SIO 117**

Instructor: Ralph Keeling (rkeeling@ucsd.edu)
Teaching Assistant: TBD

Lecture: MWF 1:00-1:50 p.m. MANDE B-150 Discussion: Fri 2:00-2:50 CSB 005
Zoom Office Hours: Tuesdays, 3:30-5:00 (Keeling) Thursdays, 2:00-3:00 (TBD)

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.	Sep 29		1. Introduction **PS1**	(Neelin, 1.1-1.4,1.6)
	Oct 2		2. Elements of climate system	Archer 1, Neelin 2.1, 2.4, 2.5.1, 2.6
	Oct 4	**PS1**	3. Planetary energy balance **PS2**	Archer 2, 3 (Neelin 2.2-2.3)
2.	Oct 6		4. Molecular Structure, IR spectra	Archer 4
	Oct 9	**PS2**	5. Radiative transfer	
	Oct 11		5. – continued **PS3**	
3.	Oct 13		6. Vertical structure, hydrostatic balance, etc.	Archer 5 (Neelin 3.1.5, 3.2, 3.3)
	Oct 16	**PS3**	7. Vertical transport and convection	Archer 5 (Neelin, 2.3, 3.5, 3.6, 5.3.2, 5.3.3)
	Oct 18		7. – continued **PS4**	
4.	Oct 20		8. Horizontal momentum equation	Archer 6, Neelin 3.1, 3.2, 3.3, 3.4.4
	Oct 23	**PS4**	9. Thermal wind, baroclinic instability	
	Oct 25		9. – continued **PS5**	
5.	Oct 27		10. Climate models	Neelin 5.1, 5.4-5.6
	Oct 30	**PS5**	10. continued	
	Nov 1		11. Refinements to layer model **PS6**	Neelin 6.1-6.2 (Archer 3)
6.	Nov 3		11. – continued	
	Nov 6		MIDTERM	
	Nov 8		12. Climate sensitivity and radiative forcing	Neelin 6.1-6.2
7.	Nov 10		VETERANS DAY	
	Nov 13	**PS6**	13. Climate feedbacks **PS7**	Archer 7, Neelin 6.3-6.7
	Nov 15		13. – continued	
8.	Nov 17		14. Transient climate response	Neelin 6.8
	Nov 20	**PS7**	14. – continued **PS8**	
	Nov 22		CLASS CANCELED	
9.	Nov 24		THANKSGIVING	
	Nov 27	**PS8**	15. Greenhouse gas controls	Archer 10
	Nov 29		16. The carbon cycle and CO_2 **PS9**	Archer 8 (Neelin 2.8)
10.	Dec 1		17. Observed climate changes	Archer 11 (Neelin 7.6)
	Dec 4	**PS9**	17. – continued	
	Dec 6		18. Model projections and consequences	Archer 12 (Neelin 7.7)
11.	Dec 8		18. – continued	
	Dec 11		FINAL EXAM 11:30-2:29 pm Location TBA	