SIO 172: Physics of the Atmosphere

Winter Quarter 2020
11:00–12:20, Tuesday and Thursday
Eckart Building – Room 236

Instructor
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Office hours
Tuesday 12:30–1:00 & Thursday 10:00–11:00

Teaching Assistant
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Office Hours
Friday, 10:30 to 11:30 am

Course description
This course provides an understanding of the physical principles governing the behavior of the Earth's atmosphere, with emphasis on the atmospheric thermodynamics, radiation and clouds. Upon completion of this course, students will be able to identify and understand atmospheric processes that influence weather and climate.

Course Website & Resources
I will post all of my lecture notes and slides on the TritonEd Canvas course website https://canvas.ucsd.edu/courses/10365

Required textbook
Atmospheric Science: An Introductory Survey (2nd edition), by J. Wallace & P. Hobbs, Academic Press.
https://www.elsevier.com/books/atmospheric-science/wallace/978-0-12-732951-2

e-Book (must access via UCSD IP): http://uclibs.org/PID/240988

Evaluation
There will be one mid-term and one final examination. The exams will primarily consist of essay-type questions and quantitative problem solving. The materials included in exams will be taken directly from lectures, class discussions, and textbook reading assignments. Therefore, attendance to all lectures is expected. *Each student will be allowed to use class notes or the course textbook during the exam.*

Three homework assignments will be due at various dates throughout the quarter.

Homework:	33%	See schedule
Mid-term Exam:	33%	Thursday, February 13
Final Exam:	34%	Thursday, March 19, 11:30am-2:30pm

If you have any conflicts (officially sanctioned University academic or athletic activities) with the examination dates, I need to have that information soon so alternative arrangements can be made. If you miss any of the exams without prior approval, you will receive a zero on the exam. *No make-up exams will be given.*

Mid-way through the quarter I will offer 2 extra credit assignments that will be worth a combined total of 5 percentage points towards your final grade.

Your final grade will be determined according to the following scale:

A: 100–93	A-: 92–90	
B+: 89–87	B: 86–83	B-: 82–80
C+: 79–77	C: 76–73	C-: 72–70
D: 69–60		
F: Less than 60		

Course Schedule

Lecture	Topic	Date	Reading
1	Introduction: Thermodynamics: Basics	1/7 Tu	WH 1, 2
2	Thermodynamics: Gas Law, Hydro Balance	1/9 Th	WH 3.1, 3.2
3	Thermodynamics: 1st Law, Adiabatic Processes	1/14 Tu	WH 3.3, 3.4
4	Balloon Launch (Meet at Scripps Pier)	1/16 Th	
5	Thermodynamics: Water Vapor, Second Law	1/21 Tu	WH 3.5, 3.6
6	Thermodynamics: Theta-e, Stability	1/23 Th	WH 3.6, 3.7
7	Thermodynamics: Stability, Sonde Exercise	1/28 Tu	
8	Thermodynamics: Summary	1/30 Th	
9	Radiation: Infrared & Shortwave (HWK 1 due)	2/4 Tu	WH 4.1–4.3
10	Radiation: Satellite Remote Sensing I	2/6 Th	WH 4.5
11	Radiation: Satellite Remote Sensing II	2/11 Tu	
12	**Midterm Exam (through lecture 10)**	**2/13 Th**	
13	Radiation: Optical Phenomenon I	2/18 Tu	
14	Radiation: Optical Phenomenon II	2/20 Th	
15	Radiation: TOA Balances	2/25 Tu	WH 4.4
16	Radiation: TOA Balances, Summary	2/27 Th	WH 4.6
17	Cloud Physics: Cloud Types & Nucleation (HWK 2 due)	3/3 Tu	WH 6.1, 6.2
18	Cloud Physics: Structure, Droplet Growth & IN	3/5 Th	WH 6.4, 6.5
19	Cloud Physics: Aerosols & Cloud Modification	3/10 Tu	WH 6.6
20	Cloud Physics: Summary	3/12 Th	

Homework #3 due at time of final exam