

EART 164/264: Planetary Atmospheres

Winter 2020, WF 10:00-11:35 am E&MS D226

Class website on Canvas: <https://canvas.ucsc.edu/>

Instructor: Xi Zhang, xiz@ucsc.edu, A261 E&MS.

Office hours: Wednesday and Friday 8:30-9:30 am or by appt.

Course Goals: To provide an introduction into how we use remote-sensing observations and modeling to obtain a quantitative understanding of the structure, dynamics, composition and evolution of planetary atmospheres.

Prerequisites: EART 160. I am also going to assume some familiarity with ordinary differential equations and simple coding skills.

Textbooks:

A. Ingersoll, Planetary climates. Princeton University Press, 2013.

But it does not cover all aspects of this course. Lecture notes will be provided.

Recommended References:

1. D. C. Catling and J. F. Kasting. Atmospheric Evolution on Inhabited and Lifeless Worlds. Cambridge University Press, 2017.
2. de Pater and J. J. Lissauer, Planetary Sciences 2nd ed., 2010, Chs. 3&4
3. S. Seager, Exoplanet Atmospheres: Physical Processes, Princeton University Press, 2010
4. F. W. Taylor, Planetary Atmospheres, Oxford University Press, 2010.
5. A. Sanchez-Lavega, An introduction to planetary atmospheres. CRC Press, 2011.
6. R. T. Pierrehumbert, Principles of planetary climate. Cambridge University Press, 2011.
7. J. Chamberlain and D. Hunten. Theory of planetary atmospheres: an introduction to their physics and chemistry. Academic Press, 1990.
8. M. L. Salby, Physics of the Atmosphere and Climate (2nd edition). Cambridge University Press, 2012.

Approximate Grading Scheme:

50% Weekly homework: due by **noon on Friday** (10% penalty per day).

20% Midterm (oral exam): oral exam (about 30 min).

30% Final (either a class project or a topic summary):

Oral presentation (10-15 min)

Report (max. of 5 pages, electronic version only)

Plagiarism: Collaboration on homework assignments is permitted and encouraged. But the work that you hand in must be your own i.e. if I ask you to reproduce your work on the board without your notes, you must be able to do so. If you are ever unsure about the appropriate level of collaboration, please ask.

If you use any reference book or other outside sources (such as web sites) then you must cite the source that you use.

Disability: If you qualify for classroom accommodations because of a disability, please get an Accommodation Authorization from the Disability Resource Center (DRC) and submit it to me in person outside of class (e.g. office hour) within the first two weeks of the quarter. Contact DRC at (831) 459-2089.

Preliminary Course Outline:

The following is a rough outline of the topics to be covered this quarter. The schedule only reflects approximate timing.

- Week 1: Introduction
- Week 2: Fundamentals (structure, composition and energy)
- Week 3: Radiation
- Week 4: Chemistry
- Week 5: Dynamics, **Midterm.**
- Week 6: Evolution
- Week 7: Terrestrial planets
- Week 8: Giant planets
- Week 9: Exoplanets
- Week 10: Recap

Final presentation: Time TBD (final week, report is due a week after that)