

Course Information:

PHYS 472:	Planetary Atmospheres, 1 credit, Fall 2022
Meeting Times:	MWF, 1:00 pm-2:00 pm
Meeting Location:	Paul B. Reichardt 203
Prerequisites:	Undergraduate E&M, Classical Mechanics, Thermodynamics

Instructor Information:

Instructor:	Austin R. Smith
Office:	Elvey, 708F (Geophysical Institute)
Email:	asmith155@alaska.edu
Office Hours:	TBD, or by appointment.

Scope: Planetary atmospheres play a central role in our exploration of the solar system.

Why are atmospheres so interesting? Because we can see and sample them!

Spectroscopic observations of planetary atmospheres give clues as to the composition of the parent planet, satellite, or even comet. The density, pressure, and composition of planetary atmospheres is extremely varied. Some atmospheres are gravitationally bound, while other atmospheres freely escape (e.g. cometary “atmospheres”). Some atmospheres are tenuous (Mercury), while others harbor dense greenhouse gases (Venus). In this course we will explore the wealth of physics associated with planetary atmospheres.

Approach: The emphasis will be a very broad overview of planetary atmospheres, the approach will be comparative with the goal of better understanding atmospheric dynamics at the Earth and beyond.

Textbook: No required textbook. Recommended reading includes:

- *Principles of Planetary Climate* by Pierrehumbert, Raymond T.

- *Theory of Planetary Atmospheres : An Introduction to their Physics and Chemistry* by Chamberlain, Joseph W.
- *Planetary Aeronomy : Atmosphere Environments in Planetary Systems* by Bauer, Siegfried

Topics: We will address hydrostatic and thermal equilibrium, spectroscopy, physics of escaping atmospheres, radiative transfer, and compare planetary atmospheres throughout the solar system.

Schedule:

Day	Topic	Due
02/19	Introduction to Planetary Atmospheres	
02/21	Regions of Atmospheres and Lower Atmospheric Dynamics	
02/24	Upper Atmospheric Dynamics	Synopsis 1
02/26	Observational Methods	
02/28	Earth	HW 1
03/03	Earth Cont.	Synopsis 2
03/05	Venus	
03/07	Mars	HW 2
	Mid-Course Break	
04/11	Titan	Synopsis 3
04/14	Jupiter and Saturn	
04/16	Ice Giants	HW 3
04/18	Ice Giants Cont.	Synopsis 4
04/21	Exospheres (Moon and Mercury)	
04/23	Satellite Atmospheres (Io, Europa, Enceladus, Ganymede)	HW 4

04/25	Comets, Pluto and Triton	Synopsis 5
04/28	Final Exam	

Grading: Final grades will be determined based on the following breakdown of assigned work:

Homework:	50%
Paper Synopses and Discussion:	20%
Final Exam:	30%

Scores for specific assessments will be computed based on the actual difficulty of the work, and on average class performance, applied to all students equally. The scores of the various parts will be summed and the final course grade will be assigned as follows:

A 93–100%	B- 79–81%	D+ 65–67%
A- 90–92%	C+ 76–78%	D 60–64%
B+ 87–89%	C 68–75%	D- 57–59%
B 82–86%	C- not given	F ≤ 56%

These ranges are a guarantee and a lower bound. I reserve the right to increase your grade above these ranges based on the actual difficulty of the work and/or on average class performance. Any such increases will preserve grade ordering by weighted total score.

Student protections statement: UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve

problems, please go to the following site:

<https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>.

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ASUAF advocacy statement: The Associated Students of the University of Alaska Fairbanks, the student government of UAF, offers advocacy services to students who feel they are facing issues with staff, faculty, and/or other students specifically if these issues are hindering the ability of the student to succeed in their academics or go about their lives at the university. Students who wish to utilize these services can contact the Student Advocacy Director by visiting the ASUAF office or emailing asuaf.office@alaska.edu.

Student Academic Support:

- Speaking Center (907-474-5470, uaf-speakingcenter@alaska.edu, Gruening 507)
- Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Gruening 8th floor)
- UAF Math Services, uaf-traccloud@alaska.edu, Chapman Building (for math fee paying students only)
- Developmental Math Lab, Gruening 406
- The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, <https://www.ctc.uaf.edu/student-services/student-success-center/>)
- For more information and resources, please see the Academic Advising Resource List (https://www.uaf.edu/advising/lr/SKM_364e19011717281.pdf)

Student Resources:

- Disability Services (907-474-5655, uaf-disability-services@alaska.edu, Whitaker 208)
- Student Health & Counseling [6 free counseling sessions] (907-474-7043, <https://www.uaf.edu/chc/appointments.php>, Gruening 215)
- Center for Student Rights and Responsibilities (907-474-7317, uaf-studentrights@alaska.edu, Eielson 110)
- Associated Students of the University of Alaska Fairbanks (ASUAF) or ASUAF Student
- Government (907-474-7355, asuaf.office@alaska.edu, Wood Center 119)

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For more information, contact:

UAF Department of Equity and Compliance

1692 Tok Lane, 3rd floor, Constitution Hall, Fairbanks, AK 99775

907-474-7300

uaf-deo@alaska.edu

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- University of Alaska's Board of Regents' Policy & University Regulations (UA BoR P&R)
- 01.02.020 Nondiscrimination and 01.04 Sex and Gender-Based Discrimination Under Title IX, go to: <http://alaska.edu/bor/policy-regulations/>.
- UA BoR P&R apply at all university owned or operated sites, university sanctioned events, clinical sites and during all academic or research related travel that are university sponsored. For further information on your rights and resources go to <https://www.alaska.edu/equity/title-ix/student-placement-guidelines/>.