Atmospheres and Remote Sensing

PTY656A
Space Sciences Building, Room 301
Mon, Wed 12:45-2:00 PM

Instructor: Dr. Caitlin Griffith

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Office Hours: Monday & Wednesday 2:00-3:00
Class Website:
https://www.lpl.arizona.edu/~griffith/PTYS656A-2016/

Course Objectives: The aim of this course is to teach the fundamentals of radiative transfer in sufficient detail to allow students analyze atmospheric data and construct models of the radiative structure of atmospheres. The course will consist of two parts. On one hand, we will explore the nature of current scientific questions that are addressed with radiative transfer techniques. These include the following. What elements of Earth's atmosphere govern its radiative balance and how might these have changed to affect its evolution? How did the runaway greenhouse effect steer Venus to an equilibrium state so different from Earth's? How does Titan's methane cycle differ from Earth's hydrological cycle? What is the composition and structure of extrasolar planets, and what radiative constraints can we impose to determine the habitable zone. In this part of the course, we will discuss recent journal articles and talk to guest speakers about their work. The second part of the course will consist of largely of lectures on the theory and techniques of radiative transfer. We will begin by studying simple solutions to the radiative transfer equation, and progress to more complicated solutions, which include more radiative processes. The student will learn the underlying assumptions for various kinds of solutions as well as the applicability of each technique. This part of the course will also include discussions on thermodynamics, observations, and chemistry, to the extent that is needed so that students can, independently, approach and address scientific questions with radiative transfer techniques. This goal will in part be realized by the class project. Students will work on a radiative transfer investigation of the particular science question of their choice.

Text Book: The course title is Atmospheric Radiation and Remote Sensing (ATMO 656A). The text book is "Radiative Transfer in the Atmosphere and Ocean" by Gary Thomas and Knut Stamnes, Cambridge University Press, ISBN 0 521 40124 0 (hardback) and ISBN 0 521 89061 6 (paperback). This book is rather dry, but the material is well presented. The textbook will be supplemented by less dry and at times daring journal articles and recommended reading from several additional textbooks.

Grades will be based on three components weighted as follows:

40% Homework
30% Project
30% Quizzes (3)

Quizes
There will be two in-class quizzes, which will cover only very basic material. In fact, students are told what will be on the quiz. The purpose of these quizzes is to reinforce the basic concepts and also inform the instructor whether the students are being instructed.

Project
There is one major project required for the course. Students will work with the professor to define an investigation that includes a radiative transfer analysis. The work can be very exploratory or it can concretely address an open question in planetary atmospheres. Detailed guidelines of the project are given in a separate write-up.

Homework
There will be roughly 5-8 homework assignments, which taken together comprise half the grade. Students are encouraged to talk to each other and to the professor, if they have questions. However the homework solutions should be written independently and the detailed math and logic of the solutions should be realized independently.

Grade Scale

A: 100%—90%
B: 89%—80%
C: 79%--70%
D: 69%--60%
Below 60% is a failing grade

At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, you are welcome to let me know so that we can discuss options. You are also encouraged to contact Disability Resources (520-621-3268) to explore reasonable accommodation.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.