ATMOSPHERIC SCIENCES 749
Fall 2011
ATMOSPHERIC RADIATION

Course Administration: http://atms749.patarnott.com

Time and Place: Tuesday / Thursday 4:00 pm to 5:15 pm, Room 300 Leifson Physics

Main Textbook: Radiation Transfer in the Atmosphere and Ocean by Stamnes and Thomas.

This course will be taught by Pat Arnott. Office hours 1 pm to 3 pm Wednesday, or by appointment (often best).

TOPICS IN BRIEF:
Solar and terrestrial radiation spectra
Radiative transfer in the atmosphere (absorption, scattering, extinction)
Basic radiation laws
Equation of the radiation transfer
Representation of the atmospheric radiation in terms of the electromagnetic theory
Polarization of light
Rayleigh Scattering
Mie Scattering
Theory of multiple scattering for a simple 1-D atmosphere
Spectral properties of the longwave radiation in the atmosphere
Passive and active remote sensing methods
Earth radiation budget
Radiative forcing by gases, aerosol and clouds
Role of radiation in global climate modeling

Final examination: Thursday, 15 Dec 2011 – 5:00 - 7:00 p.m.

Contact: P. Arnott can be reached at patarnott@gmail.com, 775-784-6834 (office) 233-2601 (cell).

Grades: Midterm=30%. Homework=50%. Final=20%.

Policy on late homework: Late homework is not accepted except when circumstances warrant it.

Disability Statement: Any student with a disability needing academic adjustments or accommodations is requested to contact the instructor as well as the Disability Resource Center in Thompson Student Services 107 as soon as possible to allow for appropriate arrangements.

The specific plan for the course is to organize our thoughts in the same order as the book chapters, with homework problems from the text and other sources. Written solutions for homework problems should be complete, with first a statement of the problem to be solved, then the problem solution. The final and most important component is your interpretation of the problem solution -- what does it mean?

Electromagnetic radiation is the most fundamental energetic component of climate. Satellites do their jobs with electromagnetic radiation. The Earth/Sun distance and solar output are fundamentally important for life and these parameters peg the Earth as more of less a habitable planet at 255 K from an extraterrestrial perspective. As we crawl the Earth we can appreciate the surface warmth brought to us by infrared radiation emitted to the surface by atmospheric gases and clouds. In this class it is fair game, indeed essential, that we consider how the sun works, the color of water, plants, soil, snow, the sky, clouds, and the life cycle and transformation pathways for electromagnetic radiation.

The textbook for this course is a solid introduction to the subject. Class meetings will often veer from the exact content of the book so that you experience a variety of perspectives. Measurements of solar and infrared radiation will be a central feature in this course as well so that you have an optimal feel for the subject. Use the opportunity of this semester to understand the beauty, subtlety, and fundamental character of electromagnetic radiation in nature.

GUIDE TO DOING WELL:

1. Attend class, every class. Ask questions in class. I benefit greatly from questions students ask in class as it helps me refine my understanding of the subject matter, and it helps me convey topics more effectively. Other students benefit as well. I am very open to questions in class, and find that when we have a discussion rather than a monologue, we all get a lot more out of our time together, and we can make interesting discoveries as we go along.

2. Do the homework every time, on time.

3. Work with others on the homework so that you learn to work in a group, and you gain the insights of others as they gain from you.

4. Be sure you thoroughly understand the homework and course material.

5. Arrange your daily schedule so that you have time for sleep at night, and can digest the course material daily. Work on each course a little each day.

6. Get started early on everything. It helps cement your knowledge.

7. Eat well, and get some exercise. Some diversions help refresh your enthusiasm and skill.

8. Attend office hours to ask questions and refine your understanding of the subject matter.

9. Seek connections with the subjects of this course and others you are taking or will take later on.

10. Pay close attention to subjects that are of great interest to you, and you may be able to link your future employment in some way to the concepts of this course.