ATMOSPHERIC SCIENCES 749
Fall 2014
ATMOSPHERIC RADIATION

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

Time and Place: Tuesday / Thursday 9:30 am to 10:45 am, Room 300 Leifson Physics

Main Textbook: A First Course in Atmospheric Radiation, 2nd Edition, by Grant Petty

This course will be taught by Pat Arnott. Office hours 1 pm to 3 pm Thursday, 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: Tuesday, 16 Dec 2014 – 12:30 to 2:30 pm.

Contact: P. Arnott can be reached at patarnott@gmail.com, 775-784-6834

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

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

The vision 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.

Student Learning Outcomes

- Enable and enhance ability to understand and critically analyze current literature on radiation transfer related topics
- Gain and enhance computation skills for solving radiative transfer problems of contemporary importance
- Awareness and ability to use current state of the art computational methods for light scattering and atmospheric radiation transfer
- Ability to develop simple conceptual models as a guide to understanding radiation transfer
- Enable methodologies for solving research problems related to radiation transfer
- Gain awareness of the interconnections of radiation transfer and atmospheric science

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.

UNR Policies:
Student Absences: NSHE and University policy state that there are no official absences from any university class:

It is the personal responsibility of the student to consult with the instructor regarding absence from class. It is the expectation of the instructor to accommodate absences of students participating in official University functions and to be sensitive to the needs of students who face serious personal issues. In the event that a student misses a class because of a serious personal issue, the Office of the Vice President for Student Services may, at its discretion, send an explanation to affected faculty. The instructor shall make the final determination on whether the missed work can be done at a time other than during the regularly scheduled class period. It is the policy of the NSHE to be sensitive to the religious obligations of its students. Any student missing class, quizzes, examinations or any other class or lab work because of observance of religious holidays shall, whenever possible, be given an opportunity during that semester to make up the missed work. The make-up will apply to the religious holiday absence only. It shall be the responsibility of the student to notify the instructor in advance in writing, according to the policy of the institution offering the class, if the student intends to participate in a religious holiday that does not fall on state holidays or periods of class recess. This policy shall not apply in the event that administering the assignment at an alternate time would impose an undue hardship on the instructor or the institution that could not reasonably have been avoided.

Absence due to university approved extracurricular activity: The University of Nevada, Reno deeply values and supports the participation of undergraduate students in university-approved extracurricular activities. It is the spirit and intent of this policy to offer fair and equitable opportunities to all students, including those who must miss class due to participation in university approved extracurricular activities. University-approved extracurricular activities are defined as those sanctioned by the college dean and/or the provost, and may include, but are not limited to, intercollegiate athletics, band, drama, forensics and recruitment. Students who represent the University at such events shall be provided with alternate, timely accommodations for exams, quizzes, or other course assignments missed as a result of their participation. The alternate accommodations should in no way penalize or disadvantage the student. It is the responsibility of the student to provide written notice to their instructor of their participation in official University activities as soon as the student is aware of the potential need to miss class.

Medical Excuse Policy: Effective Fall 2014, the Student Health Center will no longer provide medical excuses for missed classes, exams, or assignments. This policy is based on their limited resources, which are better dedicated to providing health care; the inability for us to make valid determinations about illnesses or injuries students may have effectively managed through self care; and our commitment to student privacy. Exceptions to this policy may occur if, in the judgment of a health care provider at the Student Health Center, the student will be out of class for an extended period of time due to a serious illness or medical condition. Examples of serious illnesses or medical conditions may include but are not limited to:

Mononucleosis, which may require bed rest and/or removal from campus
Hospitalization and/or surgery
Severe injury or illness requiring prolonged bed rest

Highly contagious diseases (chicken pox, measles)

This policy is consistent with the recommendations of the American College Health Association and is similar to other colleges and universities. Reference: Policy adapted from Nazareth College and Drexel University

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.

Academic Success Services

Your student fees cover use of:

- Math Center (784-443 or www.unr.edu/mathcenter/)
- Tutoring Center (784-6801 or www.unr.edu/tutoring/)
- University Writing Center (784-6030 or www.unr.edu/writing_center)

These centers support your classroom learning; it is your responsibility to take advantage of their services. Seeking help outside of class helps you develop as a responsible and successful student.

Recording

Surreptitious or covert videotaping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. In those cases, students should understand that their comments during class might be recorded.