

SYLLABUS

ATS 622 Atmospheric Radiation

Spring Semester 2017

Professor: Michael M. Bell

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Teaching Assistant: Jon Martinez

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Time and Location: MW 11:00-11:50 am in ACRC 212B

Office Hours: WF 2:00-3:00 pm, or by appointment

First day of instruction 1/18/17, last day of instruction 5/3/17.

Student Outcomes: This is an introductory graduate level course on fundamentals of electromagnetic radiation and the radiative properties of the atmosphere, clouds, and precipitation. Students will obtain a fundamental understanding of the nature of radiation, radiative transfer for solar and terrestrial wavelengths, absorption and scattering properties of the atmosphere, radiative heating, and radiative equilibrium. More advanced topics in atmospheric radiation will be introduced near the end of the course, with an in-depth examination of a relevant topic researched in a course project.

Lecture Outline

By Week

1. Course Introduction and basics of electromagnetism
2. *No class* AMS Annual Meeting (classes will be rescheduled)
3. Basics of radiative quantities
4. The Planck function
5. Introduction to radiative transfer
6. Radiative transfer continued
7. Radiative properties of the sun and atmospheric constituents
8. Absorption and emission
9. Absorption and emission continued
10. Broadband fluxes and radiative heating
11. Scattering and optical effects
12. Scattering continued
13. Applications to climate and mesoscale modeling
14. Advanced applications
15. Summary, review, and class project presentations

Instructor may modify this schedule as needed to adjust the order in which material is presented, and some classes will be rescheduled.

Text: Course materials will be provided for each lecture on Canvas. The references below will be used by the instructor to supplement lectures.

References:

- Liou, K.-N., 2002: *An Introduction to Atmospheric Radiation*. Academic Press, 392 pp. (Available from ATSL)
- Petty, G. W., 2006: *A First Course in Atmospheric Radiation*, Sundog Publishing, 472 pp. (Available from <http://www.sundogpublishing.com>)
- Goody, R.M. and Yung, Y.L., 1989: *Atmospheric Radiation: Theoretical Basis* (ATSL)
- Thomas, G.E. and Stamnes, K., 1999: *Radiative Transfer in the Atmosphere and Ocean* (ATSL)
- Bohren, C.F. and Huffman, D.R. 1983: *Absorption and Scattering of Light by Small Particles*. (ATSL)

Grading:

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| Homework | 30% |
| Final Project | 20% |
| Midterm Exam | 25% |
| Final Exam | 25% |

Homework will be due at the date and times indicated. No late homework assignments will be accepted without prior approval. There will be two exams. Exams are closed book and closed notes. Each student will prepare and deliver an oral presentation on a topic of their choice, related to the course material. This project will require independent research and must include an appropriate literature survey.

Statement on Academic Integrity

This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (<http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf>) and the Student Conduct Code (<http://www.conflictresolution.colostate.edu/conduct-code>). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

Contact Hours: 2 (At least 2 hours of effort are expected to complete homework assignments or class projects outside of class for each hour of class time.)