Advanced topics in Radiative Transfer

ATS 721, Department of Atmospheric Science
9:00 – 10:15 Tuesdays and Thursdays, ACRC 212B
2018 Fall Term

Instructor Contact Information

Prof Christine Chiu
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ACRC 203
Office hours: Tuesdays 1-3 pm, or by appointments

Teaching Assistant Contact Information

N/A

Course Description

This course will cover the fundamentals of, and advanced computational methods for electromagnetic radiation and the radiative properties/processes involving the atmosphere, aerosols, clouds, and precipitation. Specifically, It will provide a theoretical basis and practices in forward methods of atmospheric radiative transfer. The applications will focus on the role of radiation in energy budget, climate change, and remote sensing. Topics include:

- Basic radiative transfer
- Line absorption by molecules
- Scattering by particles
- Approximate and exact radiative transfer methods
- Radiative equilibrium models
- Polarization

Course Goals

Students who complete this course successfully will be able to:

- Describe and explain theoretical principles of radiative transfer.
- Conduct radiative transfer calculations using self-written code or community models for various applications in remote sensing, weather and climate science.
- Synthesize and provide physical interpretation of radiation signatures.

Course materials

Lecture slides and notes will be available on Canvas. The instructor uses the following textbooks (copies available in the library) to supplement lectures:

- Petty, G. W., 2006: A First Course in Atmospheric Radiation, Sundog Publishing, 472 pp., available from http://www.sundogpublishing.com.
- Liou, K.-N., 2002: An Introduction to Atmospheric Radiation, Academic Press, 583 pp.
- Thomas, G.E. and Stamnes, K., 2002: Radiative Transfer in the Atmosphere and Ocean, Cambridge University Press, 548 pages.
- Stephens, G. L., 1994: Remote Sensing of the Lower Atmosphere
- Relevant journal articles

Class Participation

Students' participation and engagement are strongly encouraged. All interactions and discussions in the classroom are aimed to provide a supportive and active learning environment for students.

Grading

- Assignment #1–#5: **100 points (20 points for each)**

This course comprises lectures, tutorial sessions, and practical sessions. Assignments include derivations of equations as well as writing/using existing computer code. For some assignments, students may be asked to show their solutions and lead discussions.

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.

Disclaimer

The instructor reserves the right to make modifications to this information throughout the semester.

Preliminary Schedule of Topics, Readings, and Assignments