EAPS 53300 Syllabus

Instructor

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TBD

Course Overview

Atmospheric Physics II

A quantitative introduction to topics in atmospheric physics valuable for advanced undergraduates, and beginner-level graduate students in atmospheric, planetary and oceanic sciences. The topics include the basics of interactions of radiation (solar and infrared) with the atmosphere, and radiative transfer in cloudy and hazy atmospheres, advanced topics in atmospheric thermodynamics, such as molecular spectroscopy, and planetary atmospheres.

Required Text

An Introduction to Atmospheric Radiation. By K. N. Liou. Academic Press. Second edition, 2002. Electronic copy of the textbook available through Purdue Libraries:

https://purdue.primo.exlibrisgroup.com/permalink/01PURDUE_PUWL/5imsd2/cdi_crossref_primary_10_1256_003590003102695746

Supplementary Textbooks:

Fundamentals of Atmospheric Physics by Murry L. Salby, Academic Press, 1996. Electronic copy of the textbook available through Purdue Libraries.

Atmospheric Science: An Introductory Survey by John M. Wallace and Peter V. Hobbs. Electronic copy of the textbook available through Purdue Libraries.

Course Resources, Technology

- Course materials will be posted on the D2L Brightspace course page
- Assignments and exams will be online for all students through Gradescope
- The exam will be an open-book, take home exam

Course Outcomes

By the end of this course, you will be able to

- ✓ Describe the basic principles of Electromagnetic spectrum and Blackbody Radiation
- ✓ Describe the interaction of different components of Earth's atmosphere with atmospheric radiation
- ✓ Apply the above knowledge to explain radiative transfer in Earth's atmosphere
- ✓ Extend this knowledge to explain the radiative transfer in other atmospheres
- ✓ Explain the role of radiative transfer in Earth's climate system

Course Topics

- → Electromagnetic Spectrum
- → Some definitions: Intensity, solid angle etc.
- → Blackbody radiation and its properties
  - o The Planck's function
  - o Wein's displacement law
  - o Stefan-Boltzmann law
  - o Radiative properties of non-black materials
  - o Kirchhoff's law
- → Atmospheric Radiation and the Solar Constant
- → Radiative transfer and the greenhouse effect (simple 2 bucket model)
- → Scattering, absorption and emission
  - o Scattering: Rayleigh, Mie, and Geometric
  - o Commonly observed optical phenomena in the atmosphere
  - o Absorption by particles
  - o Absorption by molecules, absorption lines, broadening of lines
  - o Absorption by specific gases in Earth's atmosphere
- → Radiative transfer in planetary atmospheres: beer's law, indirect determination of solar spectrum, Reflection and absorption by a layer of the atmosphere
- → Applications of radiative transfer

Assignments and Exams

Your learning will be assessed through a combination of participation, mid-term exam, a term project (a group oral presentation and a term paper), and four assignments spread throughout the academic period. Details on these assignments and exams, including a schedule of due dates is given below. Rubrics to guide evaluation, and guidelines on the term project will be posted separately on the course website.

1. Assignments: There will be several assignments which will add up to 50% of the grade
2. Mid-term Exam: Take home exam to be submitted on Brightspace within the allotted time. 25% of the grade
3. Term Paper: Students are encouraged to leverage this opportunity to advance their research topics through the application of course material. 25% of the grade

Grading Scale

A+	97 - 100 points
A	94 - 96 points
A-	90 - 93 points
B+	87 - 89 points
B	84 - 86 points
B-	80 - 83 points
C+	77 - 79 points
C	74 - 76 points
C-	70 - 73 points
D+	67 - 69 points
D	64 - 66 points
D-	60 - 63 points
F	Below 60 points

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under University Policies.

Purdue's Honor Pledge: "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

Diversity Statement for Syllabi

The Department of Earth, Atmospheric, and Planetary Sciences supports an inclusive learning environment where students from diverse backgrounds and perspectives can be successful. Dimensions of this diversity can include sex, race, age, national origin, ethnicity, gender identity and expression, intellectual and physical ability, sexual orientation, income, faith and non-faith perspectives, socio-economic class, political ideology, education, primary language, family status, military experience, cognitive style, and communication style. In line with our departmental goals, we disavow all racism, xenophobia, homophobia, sexism, Islamophobia, anti-Semitism, classism, ableism, and hate speech or actions that attempt to silence, threaten, and degrade others. It is my intent to be respectful of this diversity, and to oppose actions that diminish it, as here in EAPS we embrace the notion that such diversity enriches and enhances our intellectual community.

My preferred pronouns are **she/her/hers.** I wish to respect each of your identities and want to refer to them correctly. I encourage you to share this information when introducing yourself in class, if you feel comfortable

doing so. Also, when introducing yourself in class or when communicating via email, please indicate if you have a preferred name which may differ from the information listed on Brightspace, if you feel comfortable doing so.