This graduate-level course covers the physics of radiation, the interaction of radiation with matter, and the application of radiative processes to astrophysical phenomena.

GOALS

The primary purpose of a graduate-level course is to weave into a coherent whole the threads of physics and astronomy knowledge you already possess, and to teach you to think like an astrophysicist. Accordingly, by the conclusion of this course you should be able to

- solve simple radiative transfer problems at a blackboard;
- solve more complicated radiative transfer problems by finding, reading, and applying methods from the current scientific literature; and
- interpret spectra and make good inferences about the physical characteristics of their sources.

Knowledge of undergraduate-level electrodynamics, quantum mechanics, and thermodynamics is expected. Advanced topics in these areas will be brought into the class discussion as needed, so that the course will be self-contained.

INSTRUCTOR

Prof. Edward Brown
📍 BPS 3266
📞 884-5620
✉️ browned@msu.edu
🌐 http://www.pa.msu.edu/~ebrown

Office hours are informal: if my door is open, you are welcome to drop in. You may also make an appointment.
CLASS

Official class times are Tuesdays and Thursdays, 8:30 to 9:50, in 1415 BPS. Tentatively, however, we will meet in 1300 BPS from 8:45 to 10:05. The 15 minute shift is by request; if this causes any inconvenience, please let me know.

TEXT

The primary texts are Rybicki and Lightman (1979) and my course notes, which draw on the sources listed in the references. You are welcome to borrow these books (or any others) from me for a limited time. Any updates to the course notes will be posted on D2L as they are completed.

COMPONENTS

Problem sets  Expect weekly to biweekly homework, in-class worksheets, and reading assignments. As you know, most of your competency gain occurs while working problems and discussing them with peers. We’ll spend a fair bit of class time discussing problem sets, so come ready to present your work—class participation is expected, and your contribution to the in-class discussion will be evaluated as part of your grade.

Term paper  You will write a term paper on a topic related to radiative processes in astrophysics. You will decide on this topic in consultation with me. The writing must conform in style to that of The Astrophysical Journal; I shall provide a \LaTeX template. The papers will be peer-reviewed: each of you will referee three of your classmates’ papers, and your grade will take into account both the reviews of your paper and the reviews that you write.

Exams  There will be 3–4 short written quizzes, announced in advance, and a written final.

GRADES

The overall course grade is computed using the following weights.
Grading of problem sets will be on a three-point scale: ⌂ (“needs improvement”), ✔ (“satisfactory”), and ⭐ (“outstanding”). All exams will be graded in detail.

No rule of scholarly activity is more important than giving proper credit for the contributions of others. Although you are free to consult with classmates while working on assignments, you must explicitly acknowledge them by name and indicate their contributions in the write-up. The work on the term paper and all exams must be entirely your own.

REFERENCES AND READING LIST


