

Syllabus for Physics/Astronomy 562: High-Energy Astrophysics Spring 2024, Prof. Peterson

Description: This course surveys important physical processes in a variety of astronomical settings in the field of high-energy astrophysics. We cover many individual astronomical systems such as black holes, neutron stars, white dwarfs, supernova remnants, active galactic nuclei, clusters of galaxies, and gamma-ray bursts.

Prerequisites: Physics 342 or Physics 344 or equivalent (modern physics)

Lectures: TuTh 9:00-10:15, PHYS 331, (Face to face)

Textbooks:

High Energy Astrophysics: 3rd Edition by Malcolm S. Longair

Other useful textbooks:

Radiative Processes in Astrophysics by Rybicki & Lightman
Exploring the X-ray Universe by Charles & Seward
Accretion Power in Astrophysics (3rd ed) by Frank, King, & Raine
Black Holes, White Dwarfs, and Neutron Stars by Shapiro & Teukolsky
Introduction to High Energy Astrophysics by Rosswog and Bruggen
Active Galactic Nuclei by Krolik
The Physics of Extragalactic Radio Sources by De Young
High Energy Astrophysics by Melia

Website: <https://purdue.brightspace.com/d2l/le/content/944072/Home>

We will post all homeworks & exams through *brightspace*, and will submit homeworks by *gradescope*. You can always email me in the event of any online complication. We will set up gradescope during the time of the first homework.

Office Hours:

Either after class on TuTh or virtual office hours by appointment,
peters11@purdue.edu

Course work & Grading:

5 Problem Sets (40%), Midterm (30%), Final Exam (30%)

We will also use a “curve” to make sure the grades are consistent with historical norms (median grade set approximately at the A- / B+ boundary).

Outcomes:

By the end of this class you will understand the physical processes relevant in high energy astrophysics and have a working knowledge of a variety of important astrophysical objects in the high energy Universe.

Tentative Class Schedule: (exact dates could change)

Tuesday	Thursday
1/9: What is high energy astrophysics?	1/11: Astronomical Introduction
1/16: Astronomical Introduction	1/18: Astronomical Introduction
1/23: Astronomical Detectors	1/25: Astronomical Detectors
1/30: Radiation & Particles	2/1: Radiation & Particles
2/6: Radiation & Particles	2/8: Radiation & Particles
2/13: Stars	2/15: Supernovae
2/20: Supernovae	2/22: Pulsars
2/27: Accretion	2/29: Midterm (Approx)
3/5: Accretion	3/7: Binaries
3/12: No class (Spring Break)	3/14: No class (Spring Break)
3/19: Binaries	3/21: Binaries
3/26: Binaries	3/28: AGN
4/2: AGN	4/4: AGN
4/9: GRB	4/11: Clusters
4/16: Clusters	4/18: Clusters
4/23: VHE	4/25: Review
4/29: Finals week	

Policies:

- **Extensions:** Due to Covid-19, other medical illnesses, grief/bereavement, military service, jury duty or parental leave, extensions for any assignment or exam will be ***automatically given for two weeks***. Additional extensions are also possible upon request. You will be granted plenty of time and flexibility to make up any assignment or exam, so please consider the health of yourself and the class first over any academic concern. If you are experiencing ***any significant*** illness symptoms, ***please stay home***. Just let me know via email later, and I can provide notes we will work out a plan so your educational experience is optimal given the circumstances. We may record lectures depending on conditions and how high the absences are. In the event that we need to switch to an all online course, simply pay attention to your Purdue email for details. We will cover the lectures online, and continue to use Brightspace/Gradescope for homework and exams.
- **Protect Purdue:** The [Protect Purdue Plan](#), which includes the [Protect Purdue Pledge](#), is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask [in classrooms and campus building](#), at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.
- **Academic Integrity:** Academic integrity is one of the highest values that Purdue University holds. Exams should always be exclusively your own work. Group work on homework, however, is encouraged. See also the Purdue Honors Pledge: <https://www.purdue.edu/provost/teachinglearning/honor-pledge.html> Students are expected to adhere to the guidelines provided by instructors for academic work so that no

student gains an unfair advantage. Using or attempting to use unauthorized materials, information, study aids, notes, or any other device in any academic exercise will not be tolerated. Unauthorized materials may include anything which or anyone who gives a student assistance that has not been approved by the instructor in advance.

- **AI Information:** Students may use AI tools to search for information (e.g. in a manner similar to a search engine), but students should not use AI tools to complete homework or exams. Often AI tools are not reliable or particularly useful for college-level physics or astronomy.
- **CAPS Information:** Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765)494-6995 and <http://www.purdue.edu/caps/> during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.
- **DRC Information:** Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.
- **Basic Needs Information:** Purdue University has a number of resources available to help with many struggles and any basic needs (food, housing, etc.) insecurity. Consult <https://www.purdue.edu/odos/resources/index.html> for a variety of different programs and services.
- **Discrimination:** Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. More details are available on our course Brightspace table of contents, under University Policies.
- **Emergencies:** For any emergency, we will follow the procedures on the following page: <https://www.purdue.edu/ehps/emergency-preparedness/docs/emergency-preparedness-classrooms.pdf>