

AST 520: High Energy Astrophysics

Fall 2010

Lectures: M & W 2:00-3:20pm, Peyton 140

Instructors: Jeremy Goodman & Anatoly Spitkovsky

We will study the vast and continually evolving subject of high energy astrophysics: the science of extreme environments and their observable implications. We will focus on the physics of the phenomena, with excursions into radiation, GR and gas dynamics.

The recommended books for the course are: Rybicki and Lightman “Radiative Processes in Astrophysics,” Frank, King and Raine “Accretion Power in Astrophysics,” Longair “High Energy Astrophysics, v. 1 and 2 (especially vol 2), and Schutz “A First Course in General Relativity.” These books are available on reserve in Peyton and can be purchased from any online bookseller (we did not specifically order them for this course through the campus bookstore, so they may not have enough copies). Lecture notes for Prof. Goodman’s lectures are posted online at <http://www.astro.princeton.edu/~anatoly/AST520>. There will be 5 homeworks and a written take-home final.

The course outline:

Date	Topic
Sep 20	Astrophysical Special Relativity (JG)
Sep 22	Astrophysical Special Relativity (JG)
Sep 27	Astrophysical General Relativity (JG)
Sep 29	Astrophysical General Relativity (JG)
Oct 4	Astrophysical General Relativity (JG)
Oct 6	Synchrotron Radiation (JG)
Oct 11	Synchrotron Radiation (JG)
Oct 13	Gamma-Ray Bursts 1 (JG)
Oct 18	Gamma-Ray Bursts 2 (JG)
Oct 20	Bremstrahlung & Applications (AS)
Oct 25	Compton Scattering & Comptonization (AS)
Oct 27	Accretion: Spherical (AS)
Nov 1	FALL RECESS
Nov 3	FALL RECESS
Nov 8	Accretion: Disks (AS)
Nov 10	Accretion: GR disks (JG)

Date	Topic
Nov 15	Binary evolution, thick/thin disks, disk instabilities (AS)
Nov 17	Neutron Stars and Strong Field Effects (JG)
Nov 22	Neutron Stars and Strong Field Effects (JG)
Nov 24	Acceleration of nonthermal particles 1 (AS)
Nov 29	Acceleration of nonthermal particles 2 (AS)
Dec 1	Electrodynamics of compact objects: pulsars 1 (AS)
Dec 6	Electrodynamics of compact objects: pulsars 2 (AS)
Dec 8	Pulsar Wind Nebulae, Supernova remnants(AS)
Dec 13	Acceleration and collimation of relativistic jets (AS)
Dec 15	Acceleration and collimation of relativistic jets (AS)
January	Take-home final (date to be announced)