Astronomy 498: High Energy Astrophysics

Instructor:

Professor: Cole Miller, CSS 1239, (301) 405-1037, miller at astro.umd.edu

Office hours: Tuesday and Thursday, 2:00 to 3:00 PM or by appointment.

Class web page: http://www.astro.umd.edu/∼miller/teaching/astr498

I will post lecture notes a few days before each class, and assume you have read them before the actual lecture.

Schedule:

Lectures on Tuesday and Thursday from 12:30 to 1:45, CSS 2428.

Textbooks:

Required: *Introduction to High-Energy Astrophysics* by Rosswog and Brüggen.

Potentially useful: my notes from graduate high-energy astrophysics,
http://www.astro.umd.edu/∼miller/teaching/astr680/

and
http://www.astro.umd.edu/∼miller/teaching/astr688m/

Course Grading

Homework	30%
Midterm Exam	25%
Final Exam	40%
Class Participation	5%

Feel free to discuss homework with other students, but you must work out and write up the solutions yourself. Each problem in the homework and in the exams will be graded on a four-point scale. Approximately half of the credit will be for demonstrated understanding of the physical issues and/or equations associated with each problem, and half for correct solution of the problems. If you come up with an answer that is obviously incorrect (e.g., a velocity 1000 times the speed of light!), but correctly say why it is incorrect and approximately what the right answer is, you will get partial credit. For some of the problems (which will be marked clearly), to get full credit you will also need to show that your answer has the correct limits, symmetry, etc. as dictated by the problem. The midterm and final will both be in-class, and we can negotiate whether they are open-book or closed-book. The final exam will be cumulative.

Homework will be assigned approximately every two weeks, on Thursdays. The homework will be due at the beginning of class two Thursdays later, and I will return the solutions and graded homework to you by the following Tuesday. The reason I want you to turn in your homework at the beginning of class is so that you can absorb the content of that lecture instead of worrying about the problems! I will therefore enforce this policy strictly, and will take off points for, e.g., homework turned in at the end of class.

Class participation will be determined by attendance and by participation during classes; I will ask many questions during class, and although I don't expect you to get the "right" answer every time I do want you to try.

Letter Grades
I will guarantee that you will receive no worse than the following letter grades for a given percentage of the total available points:

85%–100%	A
70%–85%	B
55%–70%	C
40%–55%	D

I may grade on a curve if the class average is significantly lower than suggested by the table. There will be no extra credit.

Late Policy and Make-Up Policy

Partial credit for late homework assignments may be given if you give me a valid and documented reason by the Tuesday before the assignment is due. No credit will be given for homework turned in after the beginning of the following class on Tuesday, because solutions and graded homeworks will be handed out then. If you cannot make the midterm or the final exam, then we can arrange a different time if you tell me at least a week before the exam (to be fair to other students, the alternate time should be before the scheduled time).

Tentative Course Outline
Jan 29: Overview, astrophysical problem solving.
Jan 31–Feb 5: Special relativity (book, chapter 1).
Feb 7–12: Radiation particle processes (book, chapter 3).
Feb 14: Homework #1 due
Feb 14–19: Cosmic rays.
Feb 21–Mar 4: General relativity.
Feb 28: Homework #2 due
Mar 6: Basics of accretion disks (book, chapter 2).
Mar 11: Midterm.
Mar 13: Homework #3 due
Mar 13: Introduction to black holes
Mar 18–20: No class; spring break
Mar 25–Apr 1: Black holes (book, chapter 8 for AGN).
Apr 3: Homework #4 due
Apr 3–8: Neutron stars (book, chapter 5).
Apr 10: Accretion disks around NS and BH (book, chapter 6).
Apr 15–17: Supernovae (book, chapter 4).
Apr 17: Homework #5 due
Apr 22–24: Gamma-ray bursts (book, chapter 7).
Apr 29–May 8: Gravitational waves.
May 8: Homework #6 due
May 13: Summary and class-driven questions
May 20, 1:30-3:30 PM: Final exam.