Astronomy 320: Theoretical Astrophysics

Instructor:

Professor: Cole Miller, CSS 1239, (301) 405-1037, miller@astro.umd.edu
Office hours: Tuesday and Thursday, 3:30 to 5 PM or by appointment.
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Office hours: Monday and Wednesday, 3 to 4 PM or by appointment.
Class web page: http://www.astro.umd.edu/∼miller/teaching/astr320

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 2:00 to 3:15, CSS 2428.

Textbooks:

Required: *The Tapestry of Modern Astrophysics* by Steven N. Shore.

Course Grading

Homework	25%
Midterm Exam	30%
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 (or less, for short assignments), on Thursdays. The homework will be due at the beginning of class one or two Thursdays later, and I will return the graded homework to you by the following Thursday. 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 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 28–30: Overview, astrophysical problem solving.
Feb 4–11: Conservation laws and one-body gravity.
Feb 13–25: Two and three body interactions.
Feb 27 – Mar 4: The N-body problem.
Mar 6–11: Galactic dynamics.
Mar 13: Macroscopic properties of gas, thermodynamics.
Mar 18: Midterm.
Mar 20: Microscopic properties of gas, statistical mechanics.
Mar 25–27: Spring break.
Apr 1–3: Equilibrium and hydrostatics.
Apr 8–15: Hydrodynamics, waves, and instabilities.
Apr 17–22: Basic quantum principles and semiclassical analysis.
Apr 24 – May 1: Schrödinger equation, hydrogen atom, quantum statistics.
May 6–8: Examples of astrophysical modeling.
May 13: Recap, emphasis of points brought up during semester.
May 20: Final exam, 10:30 AM to 12:30 PM.