ASTR 210: Introduction to Astrophysics

Classes

Place: ENGR 1110
Time: TR 9:00–10:15 am
Web site: www.physics.gmu.edu/∼joe/ASTR210.html

Instructor

Joe Weingartner (he/him)
Planetary Hall, room 231
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Zoom office hours: MW 10:00–11:00, or by appointment

Learning Assistant

Mary Jimenez
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Office hours: TBA

Course Objectives

1. Develop a quantitative understanding of astrophysical objects and processes.

2. Prepare for upper-level coursework and/or research experiences in astronomy and astrophysics.

3. Reinforce basic physics concepts and skills in a novel setting.

4. Develop *active-reading* skills and habits. As you read the textbook, you should constantly challenge yourself to make sure you understand the text. This includes identifying and understanding the steps in logical arguments (so that you can reproduce them on your own), working out the omitted steps in mathematical derivations, and justifying statements that the text makes without explanation (because the author presumes that you already understand it or can work it out with some thought). The course study guide will prompt you to read in this way.

Textbook

Foundations of Astrophysics, B. Ryden & B.M. Peterson (Addison-Wesley)

We'll cover chapters 1 through 7 and 13 through 18, but not always in as much depth as the book. The detailed schedule is on the course web site.

Evaluation

Problems (100%)

1. These include traditional homework problems as well as study guides to be worked on during class time. Be sure to bring your textbook to class.
2. You are encouraged to discuss the problems with one another, but the detailed solutions that you submit must be your own, independent work.
3. Do not hesitate to seek help from me, in person or by email.
4. The point value of each problem is indicated in brackets.
5. See the course web site for due dates. Problem sets are due at the start of class. Late work will only be accepted in extenuating circumstances (medical or family emergency). If you don't finish the problem set, turn in what you have.
6. The clarity of your solutions will factor significantly into your grade. It is not sufficient to write a few equations. You must define your variables, draw well labeled figures where appropriate, and explain what you're doing. Also, you must write legibly. I will not struggle to decipher handwriting; instead, I will simply assign zero points.
7. Each time that problems are due, I will choose a fraction (possibly 100%) of the submitted problems to grade. Of course, I will not reveal in advance which problems will be graded. Your total earned points for each submission will be AB/C, where C is the total number of points in the graded problems, A is the number of points you earned on those problems, and B is the total number of points in the problems on which you made a serious effort.
8. Unless explicitly stated, you may not use computer programs like Mathematica.
9. When a problem asks you to "show" something, this should be interpreted as "derive" rather than "verify."

Letter grades for the course will be determined from total numerical grades as follows:

A range:	90-100%
B range:	80-90%
C range:	70-80%
D:	60-70%
F:	$< 60\%$

Study Strategy

This course is structured largely in the "flipped-classroom" style. Readings from both the textbook and the course notes (which are, in part, a guide to help you with the textbook readings) will be assigned for each class meeting. I will devote a small portion of class time to lecturing and reviewing the material, but for most of the class time you will be working (alone or in small groups) on problems, which will be turned in at a later class meeting. It is essential that you do all of the assigned readings (actively; see course objective 4 above) before class and make note of anything you didn't understand, so you can ask about it during class. Also be sure to attempt to answer any questions in the course notes (e.g. the question at the bottom of page 13) on your own before reading the answer. The assigned problems are all embedded in the course notes and you should examine the problems and give some preliminary consideration to how you might approach them as you read. The problems are challenging; it is expected that you will need help with them. If you're conscientious about the reading, then you'll be able to spend most of class time working on the problems and getting help from the LA and me. If you slack off on the reading at home, then you'll have to make it up during class and then do the problems on your own at home. This is a much more painful approach and results in lower grades.

Basically, I'm requiring you to take responsibility for your learning. It would be great if you could just come to class, listen to me talk, and learn astronomy. But it doesn't work that way. The only way to really learn is to do the hard work (reasoning through ideas, solving problems) yourself. The LA and I will do all we can to facilitate the process, but we can't do the work for you. By the way, you don't have to take my word for all of this–it has been well studied by cognitive scientists and education researchers. If you're interested, you can learn about some of this research in the book "Make It Stick: The Science of Successful Learning" by Brown, Roediger, & McDaniel (available as an online resource in the university catalog).

After each due date, I'll post solutions to the assigned problems (at the end of the corresponding chapter in the course notes). Be sure to carefully study these solutions, even if you get the problems right. My solution might be different or more efficient than yours and may include additional commentary.

The assigned problems include both traditional quantitative problems and qualitative questions that ask for an explanation in words. You might expect that the latter would be easier, but most students do worse on these. In many cases, the writing just isn't clear at all. I strongly advise you to read your explanations aloud to yourself and to a classmate for feedback before you turn them in. This will help you to recognize when your writing is unclear.

Civility and Inclusion

The Department of Physics and Astronomy is committed to civility and inclusion. All members, including instructors and students, are expected to abide by the department's Code of Professional Conduct.

Department/University Resources

Spectrum peer-mentoring program for physics and astronomy students

Incident Report Form

Academic Integrity

Disability Services

Learning Services

Student Support and Advocacy Center

Counseling and Psychological Services