ASTR 24100: The Physics of Stars and Stellar Systems

Prof. Robert Rosner | Winter Quarter 2018

What is this course about? Building upon a student's previous knowledge of physics, this course introduces the astrophysics of stars and stellar systems with an emphasis on the physical nature of stars. Topics include the tools of astronomy, both observational and theoretical Hertzsprung-Russell diagrams, structure and evolution of stars, binary stars, and end states of stars such as white dwarfs, neutron stars, and black holes.

Prerequisites for this course: Modern Physics (PHYS 15400) and Quantum Physics I (PHYS 23400; there are no other prerequisites.

Schedules: Lectures take place Tuesday and Thursday, 2:00 pm to 3:20 pm, in the Eckhardt Research Center (ERC), room 576; the first class is on Thursday, Jan. 4.

Text, Lecture Notes: One possible reference text is B.W. Carroll & D.A. Ostlie, *Modern Astrophysics* (Addison-Wesley). The text is helpful, but is *not* obligatory; it is available in the University Bookstore. It's been used as the course text in the past, and used copies are often available; there are 2 editions; the one in the Bookstore is the 2nd edition. The text is also used for other courses of the astrophysics undergraduate concentrator sequence. However, keep in mind that copies of my lecture notes will be available on c*anvas* (see below), and my own take is that with judicious use of the internet, and the available on-line texts, you can save yourself a lot of money without much loss of information. I will provide a list of alternative references that you might want to look at … and whether you chose to buy any of them could depend on whether you'll continue in astrophysics …

Course Website: The course website is hosted on the university's *canvas* system, at http://canvas.uchicago.edu. Relevant materials, such as homework sets and homework solutions, will be posted on *canvas*. Log in using your CNetID.

Lab: There will be an opportunity for laboratory exercises – this is something that I will be experimenting with since I really do not like "cookbook" lab sessions. So stay tuned for this; I expect that there will be two lab sessions this quarter.

Homework: Homework will be assigned on Tuesdays; it is due at **the beginning** of class period **the following week**, on Thursdays. **No late homework will be accepted**. Homework solutions will be posted on *canvas* after class on the day after the work is due (i.e., Fridays).

Exams and Grading: There will be one hourly exam; there will not be a final exam. Instead of the final, you will be required to write a paper on a topic related to the physics of stars and stellar systems; I will provide some examples of acceptable topics later this quarter, and if you have other topic ideas, please come see me to discuss this. Grades will be based approximately on the following weighting:

Homework	25%
Hourly exam	25%
Final paper	50%

Office Hours, and Other Additional Useful Facts: I can usually be found either in ERC 509 (5640 Ellis Ave.), or at the Harris School of Public Policy Studies, but I am best reached either via rrosner@uchicago.edu or right after class. There will be one graduate teaching assistant (TA), and I will provide information on contact information for the TA later this week.

The Web: The Astronomy homepage at UofC is at http://astro.uchicago.edu/ . The Web is of course a great resource – and I encourage browsing! Especially rewarding is the NASA web site: http://www.nasa.gov/ and, in particular, its Astronomy Picture of the Day: http://apod.nasa.gov.

The Honor System:

We function on the honor system. This means that you are on your honor to hand in work that is your own. This does not mean that I discourage studying and learning with fellow students – quite the contrary! What I do frown upon is such things as copying your friend's homework just before class, and just plain cheating. Note that this also applies to lab reports: although you may perform measurements in teams and share lab data, you are expected to write lab reports on your own.

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Course Calendar: Lecture Topics, and Exam/paper Schedule: Key dates for this quarter are given in this table.

Week	1st Day of week	Lecture #	Topics	Exams, etc.
1	Jan. 1	1	Introduction	-
2	Jan. 8	2, 3	Stellar phenomenology	-
3	Jan. 15	4, 5	Stellar structure	-
4	Jan. 22	6, 7	Stellar structure/Nucleosynthesis I	-
5	Jan. 29	8, 9	Nucleosynthesis II/Transport	-
6	Feb. 5	10	'Building the Sun'	**Hourly exam** Feb. 8
7	Feb. 12	11, 12	Neutrinos, 'seismology', ZAMS-to-giants evolution	**-**
8	Feb. 19	13, 14	Giants/AGB & white dwarfs	-
9	Feb. 26	15, 16	Supernovae, neutron stars & binary accretion	-
10	March 5	17, 18	Pulsating stars and black holes	Reading period
11	March 12	Final Exam Week	The final paper is due in my ERC 509 office by the morning of March 16	**Final paper**