

**Astrophysics**      **Physics 4100**      1–1:50pm MWF PHYS2167      Spring 2018  
Prof. Don Pakey      office PHYS2450      [ddpakey@eiu.edu](mailto:ddpakey@eiu.edu)

office hours: Mon. 2pm, Wed. noon, & Fri. 10am & 2pm. Feel free to email me or stop by any time. I am usually out of town on Tuesdays & Thursdays.

**website:** <http://www.ux1.eiu.edu/~ddpakey/>

I will be posting course materials here throughout the semester.

**Textbook:** An Introduction to Modern Astrophysics by Carroll & Ostlie (2nd edition, 2007).

**Course content & pep talk:** Astrophysics is, as the name implies, the application of physics to astronomy. The book is about 1300 pages long, & covers celestial coordinates, celestial mechanics, light, special & general relativity, telescopes, stars, the solar system, galaxies, cosmology, & the early universe.

I have made a tentative schedule that covers §3.2 The Magnitude Scale, 5.1 Spectral Lines, Ch. 10 Interiors of Stars, §15.3 Core-Collapse Supernovae, Ch. 16 Degenerate Remnants of Stars except for §16.5, Ch. 17 General Relativity & Black Holes, Ch. 19 Physical Processes in the Solar System §1 & 2, Ch. 22 Minor Bodies of the Solar System §22.3 (Asteroids) & 22.4 (Meteorites), Ch. 23 Formation of Planetary Systems, Ch. 24 Milky Way Galaxy except for §3, Ch. 27 Structure of the Universe, Ch. 28 Active Galaxies §1–2, Ch. 29 Cosmology, & §30.1 The Very Early Universe & Inflation. After about a month we should be able to tell if we need to add or subtract material.

My goal for this course is for you to get a good conceptual understanding of the objects & processes that we discuss, & to enhance your ability to apply the techniques of physics & math to them. Astrophysics is the most broad area of physics, in terms of the scale of the objects studied & the knowledge & skills that are necessary. To understand astrophysics, you need to understand classical & relativistic mechanics, quantum mechanics, thermodynamics, radiation processes, and more.

What do you do when confronted with an extremely complicated & extreme environment like the interior of a star, a 10 million degree plasma undergoing thermonuclear fusion at hundreds of billions of atmospheres of pressure? Just dive right in! In Chapter 10 we make “back-of-the-envelope” calculations to show that there is not enough gravitational or chemical energy in the Sun to allow it to burn for billions of years, but nuclear fusion can do it. We make rough estimates of the conditions inside a star & study the methods by which more accurate models can be made. We study the roles of conduction, radiation, & convection in transporting energy outwards from the core of the star. What fun!

Physics majors often make careers on the basis of their modeling, mathematics, & problem-solving skills. If you work hard at this course, you may find that it is the most useful one you’ll take for enhancing these skills. Let’s go!

**Catalog course description:** (3-0-3) S-even-numbered years. An introductory course in astrophysics, with an emphasis on applying the tools of mechanics, electromagnetism, thermodynamics, and quantum theory to understand the processes inherent in galaxies, cosmology and the structure and evolution of stars.

**Prerequisites & Notes:** PHY 3080. Credits: 3

Prereqs for 3080: PHY 1371 & MAT 2443.

<b>Grading:</b>	lowest of 3 hour exams	11%
	other 2 hour exams	44% (22% each)
	final exam	25%
	homework	<u>20%</u>
		100%

Normally the grading scale is 90% – A, 80% – B, 70% – C, 60% – D, below 60% – F, & these boundaries will be shifted down by no more than about 1 percentage point at the end of the semester, depending on factors such as improvement & consistency.

**Exams:** As shown on the last page of this syllabus, the exams are tentatively scheduled for 2/23, 3/23, & 4/20. These are all Fridays, & according to your schedule you're free from 12–3 pm on Fridays, so I would like to go noon till 2 pm on exam days.

The final exam, at 12:30–2:30pm Wed. May 2, will be comprehensive.

**Homework:** There will be 10 homework assignments, due in class on the due date. Note that the due dates given on the syllabus may be only approximate; if we get behind, I'll announce new due dates in class. I will take off 25% for lateness after I have started grading that assignment. Homework will not be accepted after I have returned it to the class or posted the solutions. You must always show your work. At the end of the semester, I will drop your lowest homework grade.

You can get hints from classmates (this sentence is left over from a semester when there actually were classmates) or elsewhere, but the work must ultimately be yours. It is highly recommended to take the time to really understand the homework problems; otherwise you won't do very well on the exams.

**How to get a good grade:** Read the material & try to do the assigned problems before coming to class. I do not grade on attendance, but it's always a good idea to come to class. If you don't understand something, come talk to me (or to your classmates). To study for exams, study the text & notes, & work out as many problems as possible, always starting "from scratch" without looking at the solution.

If you're spending more than about 2 or 3 hours per day on TV, Internet, talking on the phone, etc., you might want to cut back. Studies have shown that many people think they can multitask better than they actually can - so turn off the phone & other distractions while you're working.

**Academic integrity** - Students are expected to maintain principles of academic integrity and conduct as defined in EIU's Code of Conduct (<http://www.eiu.edu/judicial/studentconductcode.php>). Violations will be reported to the Office of Student Standards.

**Students with disabilities** - If you are a student with a documented disability in need of accommodations to fully participate in this class, please contact the Office of Student Disability Services (OSDS). All accommodations must be approved through OSDS. Please stop by Ninth Street Hall, Room 2006, or call 217-581-6583.

**The Student Success Center** - Students who are having difficulty achieving their academic goals are encouraged to contact the Student Success Center ([www.eiu.edu/~success](http://www.eiu.edu/~success)) for assistance with time management, test taking, note taking, avoiding procrastination, setting goals, and other skills to support academic achievement. The Student Success Center provides individualized consultations. To make an appointment, call 217-581-6696, or go to 9th Street Hall, Room 1302.

**Learning objectives:** see <https://castle.eiu.edu/eiucaa/elibrary/PHY4100.pdf>

**PHY 4100 Spring 2018 - approximate schedule**

Monday	Wednesday	Friday
1/8 no class	1/10 no class	1/12 intro, syllabus
1/15 <b>MLK Day</b>	1/17 §3.2,5.1,10.1	1/19 §10.2
1/22 §10.3	1/24 §10.3	1/26 H1 (§3.2,5.1,10.1-3) §10.4
1/29 §10.5	1/31 §10.6,15.3	2/2 H2 (§10.4-6,15.3) §16.1,2
2/5 §16.3,4	2/7 §16.6	2/9 §16.7
2/12 §17.1	2/14 H3 (§16.1-4,6-7) §17.2	2/16 <b>Lincoln Bday</b>
2/19 §17.3	2/21 §19.1	2/23 <b>exam 1</b> (HW1-3)
2/26 H4 (§17.1-3) §19.2,22.3	2/28 §22.4	3/2 H5 (§19.1-2,22.3-4) §23.1
3/5 §23.2,24.1	3/7 §24.2	3/9 H6 (§23.1-2,24.1) §24.2,4
3/12	3/14 <b>Spring Break</b>	3/16
3/19 §24.4	3/21 §27.1	3/23 <b>exam 2</b> (HW4-6)
3/26 §27.2	3/28 §27.3	3/30 H7 (§24.2,4,27.1-2) §27.3
4/2 §28.1	4/4 §28.2	4/6 H8 (§27.3,28.1) §28.2
4/9 §29.1	4/11 §29.1	4/13 H9 (§28.2,29.1) §29.2
4/16 §29.2	4/18 §29.3	4/20 <b>exam 3</b> (HW7-9)
4/23 §29.4	4/25 H10 (§29.2-3) §29.4,30.1	4/27 §30.1

final exam: 12:30-2:30pm Wed. 5/2/18