

# Physics 107 – Elementary Astronomy – Fall Semester 2017

## Online Learning

### Instructor

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University email is preferable to a phone call, and will provide you with a written response you can save. Video conferences in my "virtual office" are available too, through the Zoom conferencing system if you have a microphone and webcam, or an Android cellphone or Iphone. Please send an email first to set up an appointment and for connection instructions.

### Objectives

This course examines the entire universe, as observed today with the instruments of modern technology, and as explained with the ideas of physicists and astronomers. It meets the University's General Education Requirements for a three hour Natural Science course. There is a separate optional Physics 108 laboratory, also offered online.

As with other General Education Natural Science classes, the objective of this course is to incorporate astronomy into your critical thinking skills, and to understand how the methods of science work. We will do that by exploring how physics and astronomy help us unravel the underlying mysteries of the Universe, and to

1. Help you understand (and cope with) astronomy encountered in everyday life: seasons, solar energy, and the GPS in your cell phone.
2. Provide a basis for understanding the latest developments about astronomy you will hear in the news.
3. Recognize that while physics does not fully explain the universe, it does predict the effects of intangible invisible things, even though nobody knows what they really are ... yet. (That is, not to fret when something seems incomprehensible, since science itself still does not explain everything, and has to rely on predictable behaviors of invisible things such as gravity and the properties of the fundamental particles which nobody completely understands.)
4. Present you with mysteries not yet solved, or with contradictory or untested theories, so that you may solve them in the future and win a Nobel Prize or have fun trying. (There is plenty of astronomy, not to mention physics, that we do not yet know.)
5. Teach physics and astronomy that you may apply to make life better for yourself and others now, and in the future.

6. Open your mind to new discovery by knowing that the universe should be understandable.

## Requirements

The class website will guide you through about weekly topics over the semester, and will pose specific ideas and questions to consider. While you study, you are expected to use the discussion forum on the website with other students in the same way that you would work with one another for any class. This is a very important part of the class and we monitor the forum to see where you are having difficulty. We encourage collaboration and peer instruction because our goal is to have you learn by whatever means you find most helpful, but of course you must do your own work. We will try to resolve questions you may have for the class as a whole through the discussion forum whenever we can, and to respond to email individually as needed.

Use the discussion forum, take your time to understand, ask questions when you need help, and remember the objective is to learn how to observe, reason, and use your growing knowledge and skill to understand our universe. Individual and group assistance through email, Google Hangouts, our Zoom video conferencing system, or telephone is available on request.

Each week the class website has new web-based content, suggested readings, and an interactive review. There is a graded quiz on Blackboard over the week's content that may be taken any time from Saturday morning through Monday midnight (US Eastern Time) at the end of each week. There will be three longer tests administered through Blackboard, one at midterm, one at the end of the course, and one during the final exam period. The midterm and second tests will also be open from Saturday to Monday midnight. The final exam, however, is open from the first day of finals on Wednesday, December 6, through Saturday, December 9. All course work must be completed by Saturday, December 9. We will send email reminders weekly about the quizzes and exams.

## Websites

The University's Blackboard system is its gateway to Distance Education programs:

<http://blackboard.louisville.edu/>

Use your University *User ID* and *Password* to log into Blackboard for announcements, the quizzes, tests, and the final exam.

For this Elementary Astronomy class, all of the instructional content will be managed on our program website at

<http://prancer.physics.louisville.edu/moodle>

This site is available only to registered students, and it requires a personal password that is different from your university computer password. Instructions on how to use this system

will be posted on Blackboard and sent to registered students by email on or before the first day of classes. Please contact Professor Kielkopf if you have not received this by the second day of classes, or if you have difficulty logging into the website. The University's Help Desk can only respond to questions about Blackboard.

## **Textbook**

The content will be provided online through the class website. For additional supplemental help, the free text for the course is

*Astronomy*, Openstax, 2016, by Andrew Fraknoi, David Morrison, Sydney C. Wolff  
<https://openstax.org/details/astronomy>

It is on-line, and also a downloadable PDF through the above link ("Download a PDF"). A print version is also available, through the Openstax site which links to Amazon. We have noted recommended chapters in the text for reading. Most other introductory elementary astronomy books are fine as a supplement to the on-line material too if you already have one.

In many cases, simply by using Google and looking for an appropriate entry in the Wikipedia you can find an answer to basic astronomy and physics questions, and links to far more detail than most textbooks provide. If you follow this suggestion, be selective in accepting answers from Internet resources. Wikipedia has proven to be very reliable, as are the sites supported by NASA, ESA, and ESO.

Information on useful software and other materials will be provided online. No matter what kind of computer you use, there will be tools available for you. While we are working to provide all content through advanced web-based technology, access to a desktop or laptop rather than a tablet or cellphone may be necessary for some of the required work. If you have problems with class content or software, please use our website and post your question to the Discussion Forum. Often other students have seen the same issue and will know the answer, or if not, we can work together to a solution.

## **Evaluation and Grading**

Quizzes and exams will evaluate your progress toward meeting the course objectives.

There will be a quiz at the end of each week. Weekly quizzes will be added and averaged to make 25% of your grade.

There will be 3 exams: the first is near mid-term; the second at the end covering the second half of the course, and a third one during the final exam period covers the entire course. Each exam counts 25%.

An additional 5% will be added for students who make consistent thoughtful contributions to the forum discussions on the class website.

To complete the course and receive a grade, you must meet the requirements noted above, including participation in the online components and taking all the quizzes and exams. Given that, letter grades are based on the graded quizzes and exams, and scoring on quizzes and exams is based on a simple percentage of correct answers.

Letter grades are approximately A (90 to 100); B (80 to 89); C (70 to 79); and D (60 to 69). Plus and minus grades may be used when a numerical score is within 2 points of a letter grade division.

## **Caveats**

We reserve the right to make changes in the syllabus when necessary to meet learning objectives, when new astronomical discoveries occur, or when there is a technical or software issue that requires a change in content or methodology. Any changes will be announced by email and posted in the current online syllabus and schedule.

## **Title IX/Clery Act Notification**

Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain confidential support from the PEACC Program (502.852.2663), Counseling Center (502.852.6585), and Campus Health Services (502.852.6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (502-852-5787) or University of Louisville Police (502.852.6111).

Disclosure to University faculty or instructors of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is not confidential under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer.

For more information, see the Sexual Misconduct Resource Guide.

## Getting Started

- From the notice on Blackboard or our emails to you, locate your username and your password to our class website
- Connect to <http://prancer.physics.louisville.edu/moodle>
- Select your class and log in with your username and password (case sensitive)
- First time login you will be asked to change your password
- Update your profile if you want others to know more about you (optional)
- If you have a problem with this, send an email to [kielkopf@louisville.edu](mailto:kielkopf@louisville.edu)

## What to do Weekly

- Each Monday begins a new topic for that week.
- Study content on line, work through it at your own pace.
- Read the chapters or sections that are suggested in the textbook.
- Ask and answer questions on the discussion forum.
- Take the self-assessments on the class website to see how you are doing.
- Before end of day the following Monday, complete the weekly quiz on Blackboard for credit.

## Longer Tests

- The first longer test on Blackboard covers the first half of the course at midterm from Saturday morning of that week through the end of day on the following Monday.
- The second longer test on Blackboard covers the second half of the course from Saturday morning of that week through the end of day on the following Monday.
- It is followed by a comprehensive final exam from Wednesday of finals week through the end of day Saturday.

## Grades

The final course grade is based on the average of four equally weighted components: the average of all the quizzes, the midterm, the second test, and the final.

## Schedule and Content

The primary content is on-line on the class website. These chapters are selected supplemental reading from *Astronomy* by Fraknoi, Morrison, and Wolff. These suggestions may change. Please check the class website and participate in the on-line discussions to see what other students find helpful and interesting. Weekly quizzes for credit are on Blackboard from Saturday morning through Monday midnight.

### **August 21 - 27** Constellations

Chapter 2.1: The Sky Above  
Star charts and other links on-line.

### **August 28 - September 3** Sun keeps us warm

Chapter 4.1: Earth and sky  
Chapter 4.2: The seasons  
Chapter 8.4: Life, chemical evolution, and climate change  
Chapter 15.1: Sources of sunshine

### **September 4 - 10** Telescopes & Solar system

Chapter 6.2: Telescopes today  
Chapter 7.1: Overview of our planetary system

### **September 11 - 17** The Moon

Chapter 9.1: General properties of the Moon  
Chapter 4.6: Ocean tides and the Moon  
Chapter 4.7: Eclipses

### **September 18 - 24** Mars & Saturn

Chapter 10.4: Geology of Mars  
Chapter 10.5: Water and life on Mars  
Chapter 11.2: Giant planets

### **September 25 - October 1** Comets, asteroids, meteors, and meteorites.

Chapter 13.3: Comets  
Chapter 13.1: Asteroids  
Chapter 14.1: Meteors  
Chapter 14.2: Meteorites

### **October 2 - 8** Periodic table of elements and the universe.

Chapter 5.4: Structure of the atom  
Chapter 16.2: Mass and energy  
Appendix K: The elements  
Chapter 18.1: A stellar census  
Chapter 18.4: Hertzsprung-Russell diagram  
Chapter 20.5: Life cycle of cosmic material  
Review for the first test.

**Saturday, October 7, through Monday, October 9** First test.

**October 9 - 15** Subatomic particles, birth and death of stars, black holes.

Chapter 21.1: Star formation

Chapter 22.1: Evolution from the main sequence to red giants

Chapter 23.1: Death of low mass stars

Chapter 23.2: Evolution of massive stars: an explosive finish

Chapter 21.5: Planets everywhere

**October 16 - 22** Things beyond our understanding.

Chapter 25.3: Mass of the galaxy

Chapter 28.4: Challenge of dark matter

Chapter 28.5: Structure of the universe

**October 23 - 29** How to measure distances across the universe.

Chapter 19.2: Surveying the stars

Chapter 19.4: H-R diagram and cosmic distances

Chapter 26.4: Extragalactic distance scale

**October 30 - November 5** Special and general relativity.

Chapter 24.1: Introducing General Relativity

Chapter 24.2: Spacetime and gravity

Chapter 24.5: Black holes

**November 6 - 12** The expanding universe and the beginning of time.

Chapter 26.5: Expanding universe

Chapter 29.1: The age of the universe

Chapter 29.2: A model of the universe

Chapter 29.3: The beginning of the universe

**November 13 - 19** Galaxies near and far.

Chapter 26.1: Discovery of galaxies

Chapter 26.2: Types of galaxies

Chapter 29.4: The cosmic microwave background

**November 20 - 26** Thanksgiving Holiday week.

**November 27 - December 3** The story of the universe.

Chapter 29.3: The beginning of the universe

Chapter 29.5: What is the universe really made of?

Chapter 29.6: The inflationary universe

Review and study for second test.

**Saturday, December 2, through Monday, December 4** Second test.

**Wednesday, December 6, through Saturday, December 9** Final exam.