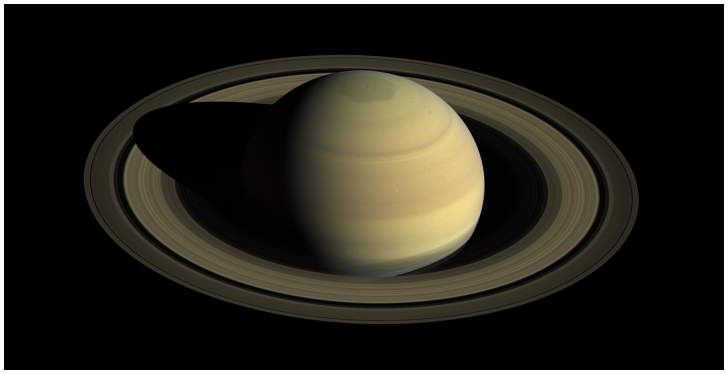
Physics 104 Astronomy: The Solar System Lafayette College Fall 2025



Saturn, photographed by the Cassini space probe, April 2016.
Source: https://photojournal.jpl.nasa.gov/catalog/pia21046

Instructor

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Course Website

We will use Moodle, `http://moodle.lafayette.edu` or `http://my.lafayette.edu`.

Course Locations and Times

Class:	Hugel Science Center 142 Monday, Wednesday, Friday: 1:40-2:30 pm
Lab:	Hugel Science Center 142 Tuesday 7:00-9:45 pm In the latter part of the semester, as the sun sets earlier, some lab sessions will involve taking telescopes to Merrill Creek Reservoir and making observations (bus shuttle from campus). The timing of these observing sessions, including bus transpiration time will be the same as the usual Tuesday evening lab times.
Moon Lab:	You will make observations of the Moon on twelve evenings over the course of the semester. This will be done on your own and will require a few minutes per night. Details will be given the second week of classes.

Office Hours

I will have weekly office hours. The times will be set in the first week of the semester, at which time they will be posted on Moodle and announced in class and via E-mail.

Office hours are a great time to stop by for questions about course material, homework problems, or anything else related to the class. If you wish to meet, but have conflicts with my scheduled office hours, E-mail me to schedule an appointment, or just stop by and try your luck.

Text

We will use *The Cosmic Perspective: The Solar System, 10th edition, with MasteringAstronomy* by Bennett, Donahue, Schneider & Voit, Addison-Wesley. The simplest way to access it is as an electronic text in which it is bundled with access to MasteringAstronomy, an on-line system we will use for homework. The College store has the relevant information.

Readings will be announced week by week in class and on homework assignments.

Homework

There will be weekly homework assignments. Most will include both on-line and paper components. Assignments will be distributed on paper in class and also posted on Moodle. On-line problems will be done in MasteringAstronomy.

Homework will be due on Fridays in class. The first assignment will be due Friday, September. 5. Late written work will be accepted for 50% credit through the following Monday. Late on-line work will be accepted on a sliding scale (with gradually increasing penalties) from Friday at 1:40 p.m. until Monday at 1:40 p.m.

If you cannot complete a homework due to illness, family emergency, religious observation, or similarly compelling reason, please contact me. (Also see the section on "Dean's excuse policy" in the Student Handbook.)

I encourage you to work with other students on problems involving calculations and analysis. Try the problems yourself. When you get stuck, talk to someone else about them. Physics and astronomy can be challenging subjects! Working with others is a great way to learn. However, on-line and paper work you submit for homework should be ultimately be your own work.

I will have extensive office hours. Please come visit if you have any questions about the homework, or anything else for that matter.

Exams

There will be two hour exams. They will be in the lab periods on Tuesday, October 6, and Tuesday, November 18. Each exam will cover material from the weeks leading up to it. Exam problems will typically resemble homework problems.

There will be a final exam during the final exam period, at a time and place designated by the Registrar. It will be a comprehensive exam, covering all aspects of the course.

Exams will be closed-book, but you will be able to create your own crib sheets for the exams. Details of the crib-sheet procedure will be given before the first exam.

Grading

There must be grades. Your course grade will be based on:

Lab, Observing, Moon Project	15%
Homework	25%
Exam #1	15%
Exam #2	15%
Exam #3 (finals week)	30%

I will post grades on Moodle. The exam grades may be re-scaled depending on the difficulty of the exam. I will use the following numerical score when setting letter grades:

A	92.500 and higher	C	72.500−76.499
A−	89.500−92.499	C−	69.500−72.499
B+	86.500−89.499	D+	66.500−69.499
B	82.500−86.499	D	62.500−66.499
B−	79.500−82.499	D−	59.500−62.499
C+	76.500−79.499	F	59.499 and below

Course Topics

The college catalog has a good summary of the course:

> An introduction to the study of the Sun and its contingent of planets, moons, comets, and asteroids. Up-to-date details of the orbits, surfaces, atmospheres, and interior structures as deduced from telescopic and spacecraft data are discussed. The elementary physics of gravity, orbits, and distance measurement leads to a limited amount of problem solving. Includes laboratory sessions and occasional nighttime observing sessions with telescopes. Requires only high school algebra and trigonometry. Not open to students with credit for PHYS 131, PHYS 151, or PHYS 208.

What the catalog neglects to point out is just how cool astronomy is. It is amazing that we can use very simple rules to understand large and esoteric things like planets, stars, galaxies, and even the Universe itself. It is astounding that we can find rational ways to discuss seemingly crazy ideas like searching for extraterrestrial life. Those of us who make our living studying this stuff have a lot of fun, and we are amazed that we are actually paid to do it.

But I digress, so let's get back to the Physics 104 Syllabus.

The course is divided into the following ten topics. Time spans listed here are approximate. Topic coverage and reading assignments will be updated on a weekly basis.

1. *Overview of the Universe and the place of the Solar System within it. (1-1/2 weeks)*
   Text §1-3.
   An inventory of the universe. Time and length scales. Angles and some methods of measurement. Development of the Sun-centered model of the solar system.
2. *Orbits. (1 week)*
   Text §4.
   Kepler's Laws.
3. *Telescopes. (1 week)*
   Text §6.
   Design and use of telescopes: angular resolution and light gathering. Telescopes across the electromagnetic spectrum. Limits on observing due to the Earth's atmosphere.
4. *Planet surface temperatures. (1 week)*
   Text §5.4 & 10.1.
   Thermal radiation, energy balance, and planet surface temperatures.
5. *The Solar System Overview. (1-1/2 weeks)*
   Text §7-8.
   Radiometric dating. Formation, age, and structure of the solar system.

6. *Terrestrial Planets. (3-1/2 weeks)*
   Text §9-10.
   Mercury, Venus, Earth & Moon, Mars. Planet compositions, surfaces, atmospheres.
7. *Jovian Planets, their moons, and their rings. (2 weeks)*
   Text §4.5, 11.
   Jupiter, Saturn, Uranus, Neptune. Moons. Rings.
8. *Smaller solar system bodies. (1 week)*
   Text §12
   Comets, Asteroids, Kuiper Belt, Oort Cloud, etc.
9. *Extrasolar planets. (1-1/2 weeks)*
   Text §5.4, 13
   Techniques for discovering planets around other stars. Inventory of known extrasolar planets. Prospects for future discoveries.

Outcomes

After completing this course, among other things, you will be able to....

- Use simple optical telescopes.
- Understand how the Solar System is studied using telescopes and space probes.
- Make geometric calculations for purposes such as measuring distances.
- Calculate planet surface temperatures and understand the greenhouse effect.
- Describe the basic characteristics of the bodies in the solar system.
- Understand how the bodies in the solar system formed and obtained their present-day characteristics.
- Understand how planets are discovered around other stars.

In addition to the outcomes listed above, this course will promote the following outcomes from the Study of the Natural World (with lab) section of the Common Course of Study:

- NW1. Employ the fundamental elements of the scientific method in the physical and natural world by identifying and evaluating a testable scientific hypothesis.
- NW2. Create and evaluate descriptions and representations of scientific data via equations, graphs, tables, and/or models.

Whom we root for (besides Lafayette, of course)

We root for the Philadelphia Eagles. Go Birds!

What to call me

Please, let's all use first names. Call me David.

Intellectual honesty

You are expected to abide by the principles of intellectual honesty outlined in the Lafayette College Student Handbook (available from `http://conduct.lafayette.edu`).

Learning is a collaborative process. Discussion and collaboration on homework in this course is very strongly encouraged. "Collaboration" does not mean "copying." You must understand and individually write out your answer to each problem.

You may use resources on the internet, including generative artificial intelligence based tools, if they help you learn the material in this course. However, you should work assigned homework problems on your own, or with help from other human beings such as your classmates and/or instructor.

For some labs and observing projects, you will collect data and submit reports with other students. For others the work must be entirely your own. Details will be given with each lab or observing project. When in doubt, ask.

Exams must be done on your own, using only materials specifically allowed. This will be discussed in detail before each exam.

Attendance

Class sessions. I expect you to attend class sessions. However, attendance is not directly factored into your course grade, and I do not maintain class attendance records. Also, I understand that there are occasional times that students need to miss classes. Having said that, as a courtesy, please let me know if you need to miss class.

Lab sessions. I expect you to complete all the labs, which requires attending the lab sessions. However, you can be excused from lab sessions for such reasons as illness, family emergency, or College-related conflict (e.g., sports meets). If you need to miss a lab session, please contact me. Missing labs which are unexcused and not made up will be counted as a 3 percentage point penalty out of your total course score for the semester.

Accommodation

My policy. It is important to me that you do well in this class. If you have any disabilities which you feel may interfere with your ability to succeed and prosper in this class, please contact me to discuss ways of accommodating them.

Please also note the following formal guidance from the College. In compliance with Lafayette College policy and equal access laws, I am available to discuss appropriate academic accommodations that you may require as a student with a disability. Requests for academic accommodations need to be made during the first two weeks of the semester, except for unusual circumstances, so arrangements can be made. Students must register with the Office of the Dean of Advising and Co-curricular Programs for disability verification and for determination of reasonable academic accommodations.

Credit hour statement

The student work in this course is in full compliance with the federal definition of a four credit hour course.