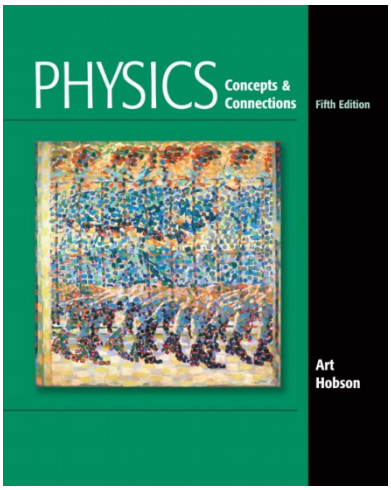
Syllabus for PHYS 0081
Light & Matter, Space & Time
Fall 2019



Course Information

CRN 30018
Location 104 Thaw Hall
Lecture MWF 2:00PM – 2:50PM
Text *Physics Concepts and Connections, 5th Edition* by Hobson
Prerequisites Any MATH course greater than or equal to 0031 (minimum grade of C).
General Studies Requirements – This course will fulfill one of the Natural Sciences requirements

Instructor Prof. Sandhya Rao
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Office hours Thursday: 3:00PM – 4:30PM or by appointment

Text and Materials

The textbook for this course is *Physics Concepts and Connections, 5th Edition* by Hobson (Addison-Wesley). The eBook version can be purchased at pearson.com for $29.99. You can also purchase a used paperback copy online for a similar price.

Courseweb: https://courseweb.pitt.edu Reading and homework assignments as well as lecture slides will be posted on Courseweb. All course-related announcements will be posted here, so make sure you check it often.

Course Description and Objectives

Course Description: This course will introduce you to the physics of the 20th century by looking at very small scales and very large scales. In order to do this it will be necessary to learn about physics prior to the 20th century, so you will also be introduced to the "classical" physics of mechanics and electromagnetism. However, the majority of the course will focus on more contemporary topics like Special and General Relativity, astrophysics, cosmology, quantum theory and other topics.

This course may contain trace amounts of math. If you think of math as a language, then it turns out to be the best language for describing the concepts in physics. Memorizing formulas will not be required. Familiarity with numbers, orders of magnitude, proportionalities, and interpreting graphs will help in understanding concepts. MATH 0031 (Algebra) is the minimum requirement for this course, and we won't go beyond that.

Objectives: A student successfully completing this course will be able to:

1) Describe what physics is, what natural phenomena are explained by the science of physics, and what physicists study.
2) Describe current topics in particle physics and cosmology and the experimental devices used to study them.
3) Identify the basic physical laws of nature.
4) Explain where scientific knowledge comes from.
5) Describe Newton's laws of motion and gravity.
6) Outline the atomic theory of matter.
7) Describe the nature of energy.
8) Describe the nature of light, electricity and magnetism.
9) Outline relativity and quantum theory.
10) Explain the structure of matter based on fundamental building blocks.
11) Apply the fundamental laws and principles of physics to simple problems.

Chapters and general topics covered:

Chapters 1 & 2: Astronomy and Atoms
Chapters 3 & 4: The Physics of Galileo and Newton
Chapters 5 & 6: Gravity and Energy
Chapter 8: Electricity and Magnetism
Chapter 9: Waves and Light
Chapter 10: Special Relativity
Chapter 11: General Relativity and Cosmology
Chapters 12 & 13: Quantum Theory
Chapter 17: Particle Physics

Exams and Exam Policy: Students must bring their ID cards to exams, and note their "PeopleSoft" number on both the question and scantron answer sheets. Students will also be required to sign both sheets. Four mid-term exams will be given. These mid-terms will not be cumulative; they will each cover approximately one-quarter of the course material. There is no final exam. Make-up exams will only be given under special circumstances and will require a written excuse from a doctor or advisor.

The use of books, notes or other written materials, computers, cell phones, and all devices that render documents, graphics, or connect to the internet are absolutely prohibited.

Exam Dates:

- **Exam 1: Friday, September 20**
- **Exam 2: Monday, October 14**
- **Exam 3: Wednesday, November 6**
- **Exam 4: Friday, December 6**

Homework: Homework will be assigned each week. The homeworks will be posted on Courseweb.

Grading scheme: The course grade will be determined from the curve of the distribution of your total percentage grades. Obtaining >90% of points guarantees an A, >80% of points guarantees a B, >70% of points guarantees a C, and >60% of points guarantees a D. If you are taking the class pass/fail, you need to achieve a score equivalent to a C or higher to receive a passing grade.

- Four mid-term exams: 80%
- Homework: 15%
- Clickers and Classroom participation: 5%

Lecture Questions: The lecture hall is equipped with hand-held radio transmitters, called clickers, used by the students to answer multiple choice questions. At the beginning of the semester you will be assigned a number that corresponds to a particular clicker and you will use that same clicker throughout the semester. The clickers will be stored in bins on carts at the front of the room so that you may pick up your clicker as you enter the hall and then place it back there as you leave. **Do not take your clicker out of the classroom!** The clickers in the lecture hall will not work with other SRS systems on campus.

Please observe the following rules for the clickers:

1. Memorize your clicker number and where it is located on the cart.
2. Pick up your clicker as you enter the classroom.
3. If your clicker is missing, check nearby bins as it may have been misplaced. If you still cannot find it then record this on the clicker sheet.
4. **Do not pick up a clicker that is not assigned to you or use more than one clicker (such as when a friend is absent). This will negate your clicker score for the entire semester.**
5. Answer the multiple choice questions by pushing the appropriate key on your clicker.
6. Record any sort of technical issue with your clicker (such as a dead battery, error light, etc.) on the clicker sheet at the end of class.
7. **Place the clicker back in the proper bin at the end of lecture**.

During the lectures you will be asked to answer multiple choice questions. You will be given some time to think about each question and discuss it with your neighbors. During this time the SRS receiver will pick up all of the responses and tally the results. The questions are intended to motivate discussion with your peers and to provide the instructor with feed-back on how well you understand the material. You will receive full credit (100%) for each correct answer, 80% for each incorrect answer, and 0% for no response.

Where to Get Help

Don't hesitate to contact me if you have any questions about the homework problems or anything else. In addition, the Department of Physics and Astronomy provides free assistance for all students. The **Physics Help Room** is staffed with graduate students who can answer homework related questions, explain basic concepts and help you with the math. This is a free service and you are encouraged to use it. The Physics Help Room is located in Thaw 312.

Academic Integrity

All students are expected to adhere to the standards of academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity (https://www.provost.pitt.edu/sites/default/files/academic_integrity_guidelines.pdf). This may include, but is not limited to the confiscation of the examination of any individual suspected of violating the University Policy.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services, 216 William Pitt Union, (412) 648-7890/(412) 383-7355 (ITY), as early as possible in the term, DRS will verify your disability and determine reasonable accommodations for this course.

Statement on Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.