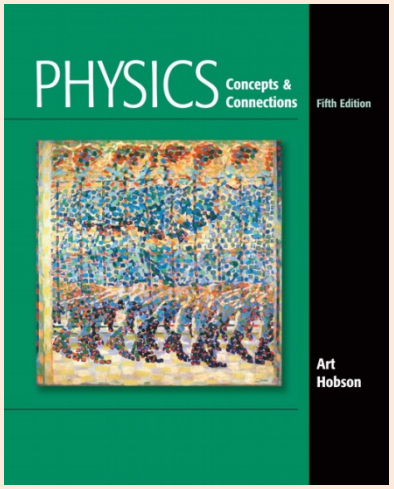
Syllabus for PHYS 0081
Space & Time, Light & Matter
Fall 2020



INSTRUCTOR: Dr. Sandhya Rao
Office: 317 Allen Hall
Email: srao@pitt.edu (email me using Canvas Inbox)
Office hours: Tuesday 3:00PM – 5:00PM or by appointment
Face to face meetings on Zoom. Sign up will be via Canvas calendar.

At the outset, I would wholeheartedly like to welcome you to our class! These are difficult times, and for most of us, learning and teaching under these circumstances is a whole new ball game. Rest assured that I am committed to making this an enjoyable and successful semester for you. There will likely be some teething problems as we get used to the new format. But we will work through them, and I am here to help you get through any issues that come up to the best of my ability. Many of the things you will learn in this course will blow your mind ☺. It's a journey. Be engaged and enjoy it!

LECTURE: MWF 2:20PM – 3:10PM

All our lectures will be live online on Zoom. The Zoom ID will be provided for lectures and will have to be accessed through our course page on Canvas. The lectures will be recorded and posted on Canvas. Students will not be recorded. Attendance during the live lecture is strongly recommended if technically possible but is not required. I do understand that due to connectivity issues or distant time zones, attendance may not be feasible.

Text and Materials

The textbook for this course is *Physics Concepts and Connections, 5th Edition* by Hobson (Addison-Wesley). You can purchase a used paperback copy online (or rent the book) for about $30 or less. A new book costs over $150!

CANVAS: Our course will be hosted on Canvas, the learning management system that all classes at Pitt now use (canvas.pitt.edu). Firefox and Chrome browsers work best. If you are registered for this class, you already have access to our Canvas page. I will organize all materials for the class into modules, one module per chapter. There is also a Canvas app that you can download onto your phone or tablet. All course materials will be accessible through the app. You will be able to access our Zoom lectures, homeworks, exams, Gradescope (paperwork submission site), discussion groups and every other aspect of our course from within our Canvas page.

DISCUSSION BOARDS: In lieu of in-class participation, you will be engaging in discussions on class topics via Canvas discussion boards. A question will be posted each week, and you will be required to respond. The class will be divided into discussion groups. You will be graded on your level of participation and relevance of your posts. Guidelines will be posted.

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: Four exams will be given; they will each cover approximately a quarter of the course material. The exams will be a mix of short essay and multiple-choice questions. The use of books, notes or other written materials, calculators, and browsing the internet are prohibited. All exams will be online. The exams will not be proctored, so I am placing enormous trust in you to obey the rules of the exam. All students must practice academic integrity as laid out by the University. Integrity and honesty are qualities that will serve you well in all aspects of life, and class is no different.

Exam Dates:

- **Exam 1: Monday, September 11**
- **Exam 2: Monday, October 5**
- **Exam 3: Friday, October 30**
- **Exam 4: Friday, November 20**

Homework: Homework will be assigned each week and will be posted on Canvas.

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: 60%
- Homework: 20%
- Discussion boards: 20%

University COVID-19 Statement

In the midst of this pandemic, it is extremely important that you abide by public health regulations and University of Pittsburgh health standards and guidelines. If in class, at a minimum, this means you must wear a face covering and comply with physical distancing requirements; other requirements may be added by the University during the semester. These rules have been developed to protect the health and safety of all community members. Failure to comply with these requirements will result in you not being permitted to attend class in person and could result in a Student Conduct violation. For the most up-to-date information and guidance, please visit coronavirus.pitt.edu and check your Pitt email for updates before each class.

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. 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. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and calculators.

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 the Disability Resources and Services (DRS), 140

William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Code of Conduct

Communication is key to a productive learning environment, and we can maintain productive communication by exhibiting respect for one another. The success of the course for yourself and others depends on all of our commitment to behavior that demonstrates respect for differences, understanding towards others and a willingness to listen and learn. For these reasons, it is unacceptable to harass, discriminate against, or abuse anyone because of race, ethnicity, gender, disability, religious affiliation, sexual orientation, or age. If you witness or are subject to such harassment, please report it to the instructor or to the Office of Diversity and Inclusion.

Title IX

Legal text: "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance."

As a professor I am a mandatory reporter, and I am required to report violations of Title IX that I observe or am made aware of to the Title IX office. Title IX violations include, but are not limited to, sexual harassment, sexual violence and verbal or sexual abuse. Within the classroom, behavior in violation might appear as: suggestive jokes or innuendos, inappropriate touching, and unwanted sexual behavior or advances, but my capacity and obligation to report does not end at the classroom.