



PHYS 1010 – Spring 2017  
The Physical Universe  
Tues/Thur 12:30-1:45 pm, Room 203 JBL



Prof. Craig Group  
rcg6p@virginia.edu  
<http://people.virginia.edu/~rcg6p>  
Phone at 113 HEP:(434) 243-5552  
Office Hours: Room 302 Physics: 2-3pm, Thu/Fri

## The Physical Universe

How does the Universe work? That's a really big question. Answers can be sought in many disciplines, and, unsurprisingly, the answers can be complicated. Physics encompasses the study of the Universe; from the largest galaxies to the smallest subatomic particles. Basic physical laws can be used to understand, predict, and control almost everything that we encounter in everyday life. To put it bluntly, understanding physics can make you a more productive and powerful human!

We live in a modern technologically-advanced society. The impact of science on our daily lives is more and more evident every day. It is important that every person develop a foundation of scientific literacy, regardless of one's chosen career or life trajectory. This helps ensure that we are capable of making thoughtful, informed decisions as citizens and members of the global community.

## Course Description and Goals

PHYS 1010 gives a broad introduction to the physical sciences with the goal of discussing our solar system, our galaxy, and the cosmology of our universe in the final weeks. PHYS 1010 is for non-science majors; science and engineering students should take another introductory physics track as prescribed by the requirements for your major program. Pre-medical and pre-dental students should take PHYS 2010,2020.

Mathematics is the language of the physical sciences, so any introduction to physics and the physical universe would be incomplete without some reliance on the underlying mathematical relationships. It is expected that you can perform simple arithmetical calculations, including the calculations of sines and cosines of angles and similar trigonometric functions.

In our introductory survey we will learn basic physical principles with the primary goal of applying them to increase our understanding and appreciation of our physics universe.

## Major Learning Objectives:

Beyond the study of basic physical concepts we will work to:

- Understand how basic physical principles apply to the universe in which we live.
- Appreciate major scientific discoveries of the physical sciences.
- Recognize the enormous variation in length scale studied by the physical sciences and how the most relevant physical processes change over these scales.
- Identify fundamental aspects of the scientific process.

## Important tips for success

- **Readings for each lecture:** see the course schedule on the last page of the syllabus. You are responsible for reading the appropriate material before each lecture. The material of the course is what is contained in the book; some topics will not be addressed directly in lecture. Each chapter will be accompanied by a required “Learn Smart” interactive study module.
- **Homework:** due most Fridays at 8pm – obtain the assignment and submit electronically before the deadline. We will use the “Connect Plus” online homework system. So, you will need access to “Connect Plus” through [connect.mheducation.com](http://connect.mheducation.com).
- Exams: There will be two midterm exams and a final. All exams will take place in our standard lecture theater, 203 Physics.
- Actively participate in class activities.

## Learning Assessment:

Several activities will be used to assess and encourage student learning:

- **Exams (two midterms and a cumulative final):** A major objective of this course is to apply concepts and to display an introductory understanding of the material covered.
- **Homework:** The homework assignments are an important supplement to the in-class activities. Taking the homework seriously will increase the probability that you develop the objectives of this course and are able to apply your skills successfully on exams. You are encouraged to discuss problems with your colleagues; however, it is important that you are also able to work through the concepts on your own.
- **Course Participation:** Class activities have been designed based on techniques that have been proven to be effective for learning physics. For that reason, participation is strongly encouraged. Participation will be assessed for several activities:
  - *Study Modules:* Reading in advance of lecture is critical in order to maximize learning in our interactive classroom environment. Each pre-class reading assignment will be accompanied by a “Learn Smart” Study module. “Learn Smart” is an adaptive learning tool that improves productivity and identifies the most important learning objectives for each student. These modules will encourage reading and will offer opportunities for students to inform the lecture regarding material that they find interesting, challenging, or remarkable.
  - *Learning Catalytics:* We will use *LearningCatalytics*. Each student will need to purchase a semester subscription through the *Learning Catalytics* website. Use of this real-time response system in class will provide students and the professor with frequent and rapid assessment of student learning. Often, it will lead into a chance for students to discuss a challenging topic with each other. Every student will be required to have a wifi- or cellular-data-enabled smartphone, tablet or laptop with them in class every lecture. If you do not have one of these devices, relatively-inexpensive smartphones are available through online retailers such as amazon.
  - *misc:* Other class participation opportunities will include conceptual tests to understand learning progress, and daily learning reflection time to understand progress and identify concepts that may need more attention in class.
- Projects - TBD

**Teaching Assistant:** Zhijie Fan (zf3ag@virginia.edu)

– Wed 4-6pm, Thurs 3-6pm, Fri 5-6pm, room 220.

**Primary Text:** *The Physical Universe*, 16<sup>th</sup> Edition **Author:** Krauskopf and Beiser;

- Purchasing ISBN 9781259663888 through the book store (only ~\$110) will get you access to the ebook and the online homework system through Connect. With this purchase, I understand that it is also possible to obtain a loose-leaf copy of the book directly from McGraw Hill for ~\$25.

- Some hard copies of the book may also be available in the bookstore. Of course you may also order the book online.

### Grade Policy:

	A	90-100 (A-: 90-92, A+: >97)
	B	80-90 (B-: 80-82, B+: 87-90)
We will use an absolute grading scale:	C	70-80 (C-: 70-72, C+: 77-80)
	D	60-70 (D-: 60-62, D+: 67-70)
	F	<60

Two Midterm Exams	20%
Final Exam	20%
Homework	30%
Class Participation	25% (in-class response 5%, pre-class quizzes 15%, misc 5%)
Projects (TBD)	5%

### Course Policies:

- Homework policy: Assigned problems will be announced at least one week before the set is due. Late homework will be penalized if accepted.
- There will be no makeup exams or quizzes. A valid excuse for a missed exam can only be obtained before the exam.
- I trust every student in this course to fully comply with all of the provisions of the UVa honor system. Alleged honor violations, if brought to my attention, may be forwarded to the Honor Committee.
- Success in this course is possible for every single student through being diligent, working thoughtfully, and seeking help when one needs it. However the material of this class can be challenging at times. If you find yourself struggling come see me or the TA during our respective office hours or contact me through some other means. I want to help you succeed in this class!

**Course Schedule**  
**PHYS 1010, Spring 2017**

Class	Date	Sections	Required Reading	Online Homework
Introduction and Mechanics				
1	Thu 1/19	Intro/		
2	Tue 1/24	Motion	Ch.1	
3	Thu 1/26	More Motion	Ch.2	HW1 (Ch. 1 and Ch.2)
4	Tue 1/31	Energy	Ch.3	
5	Thu 2/2	More Energy		
6	Tue 2/7	Future Energy	Ch.4	
7	Thu 2/9	<b>No Class !</b>		HW2 (Ch. 3 and Ch. 4)
8	Tue 2/14	Matter and Heat	Ch.5	
9	Thu 2/16	More Matter and Heat		HW3 (Ch. 5)
10	Tue 2/21	Review/Reading day		
11	Thu 2/23	<b>Exam 1</b>	Ch. 1-5	
Waves and Atomic Structure				
12	Tue 2/28	Electricity and Magnetism	Ch. 6	
13	Thu 3/2	More Electricity and Magnetism		HW4 (Ch. 6)
	Tue 3/7	<b>Spring Break!</b>		<b>No Class !</b>
	Thu 3/9	<b>Spring Break!</b>		<b>No Class !</b>
14	Tue 3/14	Waves	Ch.7	
15	Thu 3/16	More Waves		HW 5 (Ch. 7)
16	Tue 3/21	The Nucleus	Ch.8	
17	Thu 3/23	More of the Nucleus		HW6 (Ch. 8)
18	Tue 3/28	Atoms	Ch.9	
19	Thu 3/30	More Atoms and Periodic Law	Ch.10 (only 10.9,10.10)	HW7 (Ch. 9)
20	Tue 4/4	Review		
21	Thu 4/6	<b>Exam 2</b>	Ch. 6-9	
Astrophysics				
22	Tue 4/11	The Solar System	Ch.17	
23	Thu 4/13	More of the Solar System		HW8 (Ch. 17)
24	Tue 4/18	The Stars	Ch.18	
25	Thu 4/20	More about Stars		HW9 (Ch. 18)
26	Tue 4/25	The Universe	Ch. 19	
27	Thu 4/27	More on the Universe		HW10 (Ch. 19)
28	Tue 5/2	Final Project		
29	Sat 5/6	<b>Final Exam (2-5 pm)</b>	1-9,17-19	

\* Online HW due Fridays at 7:59 PM.

\*\* LearnSmart due at 11:59 AM.