Course Syllabus

Instructor: Ben Vollmayr-Lee

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Office Hours: TBA

Textbooks:
  Richard Wolfson, Essential University Physics, vol. 2
  Physics 212 Supplementary Reading — Spring 2017
  Physics 212 Laboratory Manual — Spring 2017

Web Page: http://www.eg.bucknell.edu/~bvollmay/phys212e

Course Description

We begin with one of the great success stories in the history of physics: the laws of electricity and magnetism and their unification into a single theory known as Maxwell’s equations. This discovery helped drive the industrial revolution, enabling us to deliver power to our houses and businesses and to design all sorts of clever devices to improve our daily lives. But the topic is fundamental as well. We now understand that all chemical bonds are electric forces, and that light is simply a combination of electric and magnetic fields. Interesting!

Next we will cover wave phenomena. Waves are very much a physics topic: they are tremendously important in our daily lives and can be described with a few general principles. Most of your interaction with the world is in the form of waves, such as the light reaching your eyes, the sound reaching your ears, and the infrared waves reaching your phone. Without waves, you would be rather isolated!

Then we will study the second revolution of 20th century physics: quantum mechanics. (Relativity was the first.) Physicists noticed that our theory of electricity and magnetism predicted atoms to be unstable, which is clearly wrong. In attempting to resolve this problem, they unearthed the bizarre quantum world, where particles blend into waves and a single photon can travel multiple paths simultaneously! It’s often said that if you aren’t bothered by quantum mechanics, you haven’t understood it. So hopefully by the end of this unit you will be bothered by quantum mechanics.

Finally, we will encounter particle physics. Interestingly, the two revolutions of 20th century physics — relativity and quantum mechanics — were initially incompatible. Many physicists worked for decades to formulate a relativistic version of quantum mechanics, ending up with what is called quantum field theory. At the same time, experiments were revealing that there are many more particles out there than simply protons, neutrons, and electrons. Fortunately, these new particles fit very nicely into the quantum field theory framework, which we will explore.

It’s going to be interesting! And hopefully fun, too.
Course Structure

- **Tuesday/Thursday 9:30–10:52 am — Academic West 215**
  
The course material is drawn from the texts and the lectures. Assigned reading should be completed before coming to lecture, and a journal entry for that reading will be completed online before each lecture. Class time will be used to expand on the reading and to work through assigned problems and in-class exercises. The in-class exercises will be collected following lecture and graded for effort on a 2 point scale.

You can view the class as a mixture of lecture and problem session from PHYS 211 last fall, meaning a mixture of concept tests, whiteboard presentation, physics demos, and working on problems in groups. Attendance is required.

- **Friday 3:00-4:00 pm — Rooke 9**
  
This period will be used for supplemental activities, primarily programming physical phenomena in VPython, and developing visualizations of, say, charges moving in electric or magnetic fields, superposition of phasors, etc. No previous experience in computer programming is required. We’re starting from scratch.

- **Course Account**
  
You have a PHYS 212E account, which you access by going to the 212E course web page (see front page). Your username is your Bucknell username and initially your password is also your Bucknell username. You should log in and change your password. This account will be used for accessing solutions and for making journal entries before each Tuesday/Thursday class. **Note:** you do not have a PHYS 212 account.

- **Journals**
  
You are required to submit a journal entry for each reading assignment. These serve the purpose of encouraging you to do the reading and giving me a useful guide for what we should spend lecture time on. Because I will need to read these before class, they are due before 8:30 am on the day of class.

To submit your journal entry, log in to your PHYS 212E account. Your journal entry should demonstrate that you’ve done the reading and can contain any or all of the following: a summary, parts you found confusing, parts you found clear, parts you particularly liked or disliked, or general comments about the course.

These will be graded on a 2 point scale: 0 if there is no evidence that you’ve done the reading, 1 if there is some evidence you did the reading, but not a lot of thought put into it, and 2 if your entry reflects you’ve done the reading and put a reasonable effort into it. You will get to drop your lowest four journal scores.

- **Hand-In Sets**
  
We will have weekly Hand-In homework sets, due at 4:30 pm on Mondays, to be handed in to the same homework box that was used for PHYS 211. These problems will be quite similar to the hand-in sets you are used to, though some problems with differ
from those in PHYS 211. You are encouraged to work together on the homework sets, though you must write up the problems yourself.

Quite a few problems will be identical to those assigned in PHYS 212 and I will mark those with a star. For those problems you may seek help from PHYS 212 problem session instructors in their pooled office hours (available from the 212E website), and from the tutors in the Wednesday and Sunday evening help sessions.

**No late homework will be accepted!** This is because the solution sets will already have been distributed, and because the goal is for you to be working on the problems while we are discussing the material. You will get to drop your three lowest homework grades.

- **Exams**
  
  There will be three in-class midterm exams. The dates for these are
  
  ▶ Thursday, February 9
  ▶ Thursday, March 9 — *Note:* this is the Thursday before spring break!
  ▶ Thursday, April 13

- **Labs**
  
  Your lab is the same as the regular PHYS 212 sections, and similarly any incomplete labs would result in a deduction of 1/3 of a letter grade from your overall course grade. You will take the same lab final as the PHYS 212 students.

- **Reading Quizzes and Drills**
  
  We *do not* have reading quizzes and drills in PHYS 212E. You may, if you wish, take them anyway by going to the PHYS 212 website ([www.bucknell.edu/phys212](http://www.bucknell.edu/phys212)). When prompted for a username and password, just enter a username “211” and you will be allowed to take the drill.

**Grading**

Over the course of the semester, you will be able to earn up to a total of 740 points, distributed as follows:

- **100** points for each of three in-class tests
- **120** points for a comprehensive final exam
- **120** points for weekly hand-in homework assignments
- **60** points for a lab final, given in the same 3-hour period as the comprehensive final
- **60** points for 12 laboratory sessions.
- **40** points for VPython sessions
- **40** points for weekly in-class exercise
- **40** points for journals
Disability Statement

Any student who may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please also contact Heather Fowler, Director of the Office of Accessibility Resources (570-577-1188 or hf007bucknell.edu) who will help coordinate reasonable accommodations for those students with documented disabilities.

Honor Code

As a student and citizen of the Bucknell University community:

1. I will not lie, cheat, or steal in my academic endeavors.
2. I will forthrightly oppose each and every instance of academic dishonesty.
3. I will let my conscience guide my decision to communicate directly with any person or persons I believe to have been dishonest in academic work.
4. I will let my conscience guide my decision on reporting breaches of academic integrity to the appropriate faculty or deans.