

Physics 121b – Principles of Physics

Spring 2007 Syllabus

Physics 121b is the second part of a two-semester, calculus-based course in physics for students who want a challenging introductory course. Topics to be covered include electricity and magnetism, optics, special relativity and quantum mechanics. The course prerequisites include P121a (alternatively P116a, P117a, or P137) and a working knowledge of calculus.

Class Meetings

Tuesday and Thursday, 9:35-10:50 am, 6105 Stevenson Center
Wednesday, 3:10-4:00, 6105 Stevenson Center

Laboratory

Thursday, 5:30-8:30, Stevenson Center 3rd floor labs

Contact Information

Professor Shane Hutson
6835 Stevenson Center
343-9980 (office), 319-0027 (cell, until 10 pm)
shane.hutson@vanderbilt.edu

TA – Heungman Park
6501 Stevenson Center
343-4438 (office)
heungman.park@vanderbilt.edu

Office Hours

Monday, 1:00 - 3:00 pm
Thursday, 11:00 am - 12:00 noon

Goals for the Course

For each of the topics we cover, my primary goal is for you to learn the foundational concepts. We will start with concrete observable phenomena, build conceptual models that explain these phenomena, and then add on the mathematical details. I certainly expect you to solve problems at an appropriately challenging level, but I also expect you to use your conceptual knowledge to reason about physical phenomena. Such reasoning requires a deep understanding of physics. Although the topics we will cover, particularly electricity and magnetism, often require advanced mathematics, don't be fooled – mathematical sophistication without conceptual understanding is not physics. I will emphasize both the conceptual and mathematical aspects of physics and help you build a firm foundation for your future studies.

Class Structure

Over the last 20 years, several groups have looked very carefully at how students learn physics. They have found that student learning improves when students are actively thinking about physics instead of passively listening to a lecture. With that in mind, you will not hear much conventional lecture from me. Your success in this course will depend on your active participation. To encourage your active participation, I will use two tools: in-class “clicker” questions and pre-class “warm-up” questions (see below for details). Your participation (as measured by these tools) will count 5% of your total grade. These tools will be managed through a course website hosted by Project Galileo's Interactive Learning Toolkit (ILT) at

<http://polaris.deas.harvard.edu/galileo/students/?courseID=1397>

Clickers: You will be loaned an Interwrite RF personal response system (PRS), aka a “clicker”. During each class session, I will pose a number of questions to the class, and you will submit your answers using the clicker (much like a remote control). The clickers are on order and should be here by the first full week of classes. When you receive yours, follow the included directions to input your student ID number. This ID number will identify your answers to me. You will get 4 out of 5 points for an incorrect answer and a bonus 6 out of 5 points for a right answer, so the only way you can really hurt yourself is to not answer at all. Your answers will be anonymous to the rest of the class. Make sure you should bring your clicker to every class because we will use them nearly every day. At the end of the semester, I will collect them (and you can't get your final grade until I get your clicker back). To help you with note-taking, the clicker questions I ask each day will be posted on the ILT website AFTER class.

Warm-ups: I am committed to spending the majority of our class time working through examples and reasoning about physical phenomena. To do that and cover all the material, it is critical that you read the assigned sections of text BEFORE class. The tentative schedule of reading assignments is listed below and an updated schedule will be kept on the course ILT website. The ILT website will also list two warm-up questions that are due the night before each Tues-Thurs class session (the site will list them as due at 12:59 am EST on Tues/Thurs, so that means 11:59 pm CST on Mon/Wed). I will grade your answers to these questions based solely on effort – just demonstrate that you have read the material and thought about the questions and you will get full credit (2 pts per question). One of the questions will always ask if you found anything particularly difficult about the reading. Make sure you answer that question even if it is just to say that everything is crystal clear. I will read your responses before each class and adapt my presentation based on what the class as a whole found easy or difficult.

Homework: Assignments will be posted weekly on the ILT site. Homework is due Fridays at 5 pm in the TA's mailbox. Although I strongly encourage you to discuss the problems with your classmates while working on the assignments, in the end, your solutions should represent your own work.

Laboratory: A tentative schedule of labs is listed on the syllabus. The first lab session will be Thursday, January 18. Note that we will spend some of the lab sessions working on Vpython (www.vpython.org) simulations of physical phenomena, particularly those where the concepts get a bit abstract. Your lab TA, Heungman Park, will generally run the labs, but I will often stop by.

Exams: Three tests plus a final exam will be given during the semester. The syllabus gives the scheduled test dates and the chapters covered by each test. The three tests each count 15% of your grade. The final exam will be cumulative and count 20%.

Grading

Your course grade will include your performance on exams, homework, labs and participation as follows:

Three tests	45% (i.e. 15% each)
Final Exam	20%
Homework	15%
Lab	15%
Participation	5%

Textbook

Physics for Scientists and Engineers, 3rd Edition, by Fishbane, Gasiorowicz and Thornton (Pearson Prentice Hall, 2005: ISBN 0-13-142094-1).

Student To Do List for Thursday, January 11

1. Read the first three sections of Chapter 21 Electric Charge.
2. Sign up for the course at Project Galileo's Interactive Learning Toolkit (ILT).
<http://www.deas.harvard.edu/galileo/students/enroll/?courseID=1397>.
3. Submit your answers for the first two reading questions by midnight Wednesday (the ILT site will say the deadline is 12:59 am EST on Thurs). If you fail to get the reading questions submitted on time, then you can email me your responses.

Tentative Schedule of Topics & Reading Assignments

Since we are a small class, the following schedule will be adjusted as needed. The current reading assignment will always be posted on the ILT website.

	Date	Topic	Reading
Week 1	Wednesday, January 10, 2007	3:10 PM Welcome, Electric Charge (0.5)	
	Thursday, January 11, 2007	9:35 AM Electric Charge (1.5)	21.1-3
	Thursday, January 11, 2007	5:30 PM No lab this week.	
Week 2	Tuesday, January 16, 2007	9:35 AM Electric Charge (1.0), Electric Field (0.5)	21.4, 22.1-3
	Wednesday, January 17, 2007	3:10 PM Electric Field (1.0)	
	Thursday, January 18, 2007	9:35 AM Electric Field (1.5)	22.4-5
	Thursday, January 18, 2007	5:30 PM LAB: Orientation & Vpython Intro	
Week 3	Tuesday, January 23, 2007	9:35 AM Gauss Law (1.5)	23.1-5
	Wednesday, January 24, 2007	3:10 PM Gauss Law (1.0)	
	Thursday, January 25, 2007	9:35 AM Electric Potential (1.5)	24.1-3
	Thursday, January 25, 2007	5:30 PM LAB: Electrostatics	
Week 4	Tuesday, January 30, 2007	9:35 AM Electric Potential (1.5)	24.4-7, 25.1-3
	Wednesday, January 31, 2007	3:10 PM Capacitors & Dielectrics (1.0)	
	Thursday, February 01, 2007	9:35 AM Capacitors & Dielectrics (1.0), Currents In Materials (0.5)	25.4-6, 26.1-2
	Thursday, February 01, 2007	5:30 PM LAB: Electric Field Mapping or Vpython	
Week 5	Tuesday, February 06, 2007	9:35 AM Currents in Materials (1.5)	26.3-7, 27.1
	Wednesday, February 07, 2007	3:10 PM DC Circuits (1.0)	
	Thursday, February 08, 2007	9:35 AM DC Circuits (1.5)	27.2-5
	Thursday, February 08, 2007	5:30 PM LAB: Ohm's Law and DC circuits	
Week 6	Tuesday, February 13, 2007	9:35 AM Exam #1 (Electricity, Chapters 21-27)	
	Wednesday, February 14, 2007	3:10 PM Effects of Magnetic Fields (1.0)	
	Thursday, February 15, 2007	9:35 AM Effects of Magnetic Fields (1.5)	28.1-6, 29.1-2
	Thursday, February 15, 2007	5:30 PM LAB: Vpython	
Week 7	Tuesday, February 20, 2007	9:35 AM Production/Properties of Magnetic Fields (1.5)	29.3-5, 31.1-4
	Wednesday, February 21, 2007	3:10 PM Magnetism & Matter (1.0)	
	Thursday, February 22, 2007	9:35 AM Faraday's Law (1.5)	30.1-3
	Thursday, February 22, 2007	5:30 PM LAB: Capacitance - RC, Inductance - RL	
Week 8	Tuesday, February 27, 2007	9:35 AM Faraday's Law (1.5)	30.4-6, 32.1-3
	Wednesday, February 28, 2007	3:10 PM Inductance & Circuit Oscillations (1.0)	
	Thursday, March 01, 2007	9:35 AM Inductance & Circuit Oscillations (1.5)	32.4-7
	Thursday, March 01, 2007	5:30 PM LAB: AC Circuits	
	Tuesday, March 06, 2007	9:35 AM Spring Break	
	Wednesday, March 07, 2007	3:10 PM Spring Break	
	Thursday, March 08, 2007	9:35 AM Spring Break	
	Thursday, March 08, 2007	5:30 PM Spring Break	
Week 9	Tuesday, March 13, 2007	9:35 AM Alternating Currents (1.5)	33.1-5, 34.1
	Wednesday, March 14, 2007	3:10 PM Maxwell's Equations (1.0)	
	Thursday, March 15, 2007	9:35 AM Waves (0.5), Maxwell's Equations, EM Waves (1.0)	34.2-6, Review 14.1-7
	Thursday, March 15, 2007	5:30 PM LAB: Microwave Polarization	
Week 10	Tuesday, March 20, 2007	9:35 AM Exam #2 (Magnetism, Chapters 28-33)	
	Wednesday, March 21, 2007	3:10 PM Light (1.0)	
	Thursday, March 22, 2007	9:35 AM Light (0.5), Mirrors & Lenses (1.0)	35.1-5, 36.1-4
	Thursday, March 22, 2007	5:30 PM LAB: Geometric Optics	
Week 11	Tuesday, March 27, 2007	9:35 AM Mirrors & Lenses (0.5), Superposition & Interference of Waves (1.0)	36.5-6, 15.1-6
	Wednesday, March 28, 2007	3:10 PM Superposition & Interference of Waves (1.0)	
	Thursday, March 29, 2007	9:35 AM Interference (1.5)	37.1-4
	Thursday, March 29, 2007	5:30 PM LAB: Interference	
Week 12	Tuesday, April 03, 2007	9:35 AM Interference (1.0), Diffraction (0.5)	38.1-4
	Wednesday, April 04, 2007	3:10 PM Diffraction (1.0)	
	Thursday, April 05, 2007	9:35 AM Diffraction (1.5)	38.5-7
	Thursday, April 05, 2007	5:30 PM LAB: Spectroscopy	
Week 13	Tuesday, April 10, 2007	9:35 AM Exam #3 (Optics, Chapters 34-38)	
	Wednesday, April 11, 2007	3:10 PM Quantum Physics (1.0)	
	Thursday, April 12, 2007	9:35 AM Quantum Physics (1.5)	40.1-4
	Thursday, April 12, 2007	5:30 PM LAB: Photoelectric Effect	
Week 14	Tuesday, April 17, 2007	9:35 AM Special Relativity (1.5)	39.1-4
	Wednesday, April 18, 2007	3:10 PM Special Relativity (1.0)	
	Thursday, April 19, 2007	9:35 AM Special Relativity (1.5)	39.5-8, Review 14.8
	Thursday, April 19, 2007	5:30 PM LAB: Vpython	
	Tuesday, April 24, 2007	9:35 AM Particles & Cosmology (1.5)	45.1-7
	Thursday, April 26, 2007	3:00 PM Final Exam - Cumulative	

A Typical Week

This schedule will be adjusted on exam weeks.

Mon	Tues	Wed	Thurs	Fri
Reading Assignment & Warm-up Due 11:59 pm	Class 9:35-10:50 am		Class 9:35-10:50 am	Weekly Homework Due 5:00 pm
			Class 3:10-4:00 pm	
		Reading Assignment & Warm-up Due 11:59 pm	Lab 5:30-8:30 pm	