Syllabus: Physics 106 - Fundamental Physics II - 2011

Lectures: Walter Smith Laboratory: Walter Smith, Peter Love, & Scott Shelley

Physics 105 and 106 together constitute an introduction to physics that is suitable for students who are likely to major in the natural sciences, especially physics, astronomy, chemistry, math, or computer science. Calculus at the level of Mathematics 114 is a prerequisite for this course.

The spring semester of the sequence covers electricity and magnetism, electric circuits, optics, and special relativity. The physics of electricity and magnetism underlie many of our recent technological advances (data storage, electronic computers, television, etc.); electromagetism is also the fundamental force which governs chemistry. We will consider the ideas of Maxwell, Faraday, and Gauss among others. Our treatment of optics will focus (heh heh) mostly on interference and diffraction. Finally, we will study special relativity which is critical to understanding high speed motion, and which will drastically change your view of reality! We will apply the ideas of physics to the everyday world around us, where possible.

You should expect this course to be very interesting and exciting, and also very challenging. The material we will cover is inherently more mathematical than that in physics 105, and most people have less well-developed intuition about it. I will rely heavily on the textbook -- be absolutely certain to keep ahead with the reading, or you will be unable to get the full value from our class meetings. The laboratory portion of the course provides first-hand experience with physical systems.

There will be many resources available to assist you when you have difficulty. These include a weekly "clinic" or help session on the evening before homework is due. You will find opportunities for satisfaction and pleasure if you invest the necessary work in the course.

Instructors:

Lecture: Walter Smith KINSC L110
896-1332 (office), 896-1565 (home)
Office hours: Mon 1:30-2:30, Tues 11:00-12:00,
Thurs 2:30-3:30
Fri 1:30-2:30

Laboratory:
Walter Smith

Peter Love	INSC L105 795-6506, plove	Office hours: To be announced in lab
Scott Shelley	INSC L207 896-1310 (office), sshelley	Office hours: To be announced in lab

Electronic mail is always welcome. We will occasionally send you mail and announcements. **As a participant in this course, you are required to check your e-mail daily for corrections about problem sets, etc.**

A good way to get together is to arrange (after class) a mutually agreeable time. Please do not hesitate to contact us; no question or topic is too small. If you are having a lot of trouble with the homework, be sure to come to see Prof. Smith as soon as possible.

Feedback: If you have concerns about the course or ideas about how to make it better, you should let the us know *immediately*, either in person or by e-mail. Don't wait!

Location and times:

- *Classes*- MWF 11:30 - 12:30 in Hilles 109 (class will start promptly at 11:35). It is essential that you come to all classes to master the concepts and material in this course. It might appear to you that

you could learn everything by reading the book on your own. This is true to some extent, and doing the reading is a critical component of your education. However, physics is an unusually difficult subject to try to teach yourself. Our experience with earlier generations of students shows very clearly that students who frequently skip class learn very little, and do very poorly. Someone (or some combination of people) is paying about $80 per class meeting (three meetings per week, four classes, fourteen weeks per semester) for you to come to Haverford! :) Please don't waste this investment. All absences, for any reason (including illness, athletic events, etc.) must be discussed in advance with the instructor. Excessive absences can result in a grade of *incomplete*.

- *Laboratory* - Tuesday or Wednesday 1:15 - 4:00 pm in Harris 105, begins the second week of classes. You will be assigned to one day or the other on the basis of a form to be distributed. The laboratory does not meet every week; a schedule is contained in the lab manual. It is expected that you will attend every lab on your schedule; **any departures from the schedule must be discussed in advance** with the instructor. You will only be able to complete the lab in the alloted time if you have read the instructions thoroughly and made a good effort to understand them in advance. Therefore, you are required to come to each lab fully prepared, having read the manual and having answered all pre-lab questions beforehand.
- *Recitation* - Optional, location and time TBA. Because the material in 106 is less familiar than that in 105, it is helpful for us to have a little extra time together, so even if you chose not to come to recitations for 105, you should consider coming this semester. During these sessions, we will work through additional problems and discuss problem-solving strategies. We'll also discuss any questions you may have. (I certainly expect you to ask numerous questions during our regular class meetings, but it sometimes happens that you have a question about some old topic or some other question which you prefer to reserve for recitation.) We will not meet for recitation during the first week of classes.
- An optional *physics clinic* staffed by experienced and friendly physics majors will be run on Wednesday and Thursday evenings in the physics lounge, starting at 7:30. It is smart to go on Wednesday if possible, so as to avoid the last-minute rush.

Textbooks and supplies:

- Wolfson & Pasachoff, *Physics for Scientists and Engineers, 3rd Ed.* (Addison Wesley)
- A pocket calculator or Mathematica will be needed for problem sets and tests and in the laboratory.
- The labs will be available on Blackboard. You are expected to print out a copy of each lab for yourself. All other supplies needed in the laboratory will be provided.

Assignments and Tests:

- Written work will be assigned weekly, and is due at the start of class on the assigned date, ordinarily the Friday of the week. There will be a physics "clinic" staffed with helpful physics majors on the evening before the assignment is due. However, you are expected to make a serious attempt at each of the problems on your own before coming to the clinic.

  Some assignments will included "individual" problems. It is expected that you work on these problems without collaborating with other students, and **without getting help at the clinic.** You may ask questions of the instructor about these problems, either in person or by e-mail.

  It is important that you write your answers to the assignments in a way which is easily legible and comprehensible. A liberal arts college is supposed to teach you to communicate well; this includes physics problems. Frequently, you will need to add a few words of text to explain what you're doing, although often the equations can speak for themselves, so long as you lay them out clearly, using arrows, equation numbers, etc. as needed. For some of you, this means you may need to recopy some problems once you've figured out the correct way to do them.

- There will also be assigned reading to prepare you for class discussion. Please complete in advance of the relevant class.
- There will be two take-home examinations, (90 minutes each) plus a self-scheduled final exam. Exams will cover both concepts and problem solving. Time pressure in exam settings, while not the goal of the instructor, is not entirely avoidable. You should prepare to be able to work efficiently on the material covered and avoid poor time management choices during the exams.
- Near the end of the course, you will work on a small final project. The intensity of assignments for the last two weeks will be reduced somewhat to allow time for the projects.

Grading procedures for specific elements of the course:

• Written exercises-- **We will use a two-pass procedure for handling problem sets – please read carefully!** **PLEASE USE REGULAR PENCIL OR BLACK INK FOR YOUR PROBLEM SETS!!** After you turn in a problem set, the grader will grade it using red ink. Half of the grade for the homework will be based on this first grading pass.

Your paper will then be turned back to you **at your next class meeting**, along with "skeleton" solutions. (These are not complete written-out versions of the problems, but rather guidelines and waypoints to help you along.) At this point, consulting the skeleton solutions as needed, **using blue ink or blue pencil,** and writing on the same paper you originally turned in, you will complete any problems which you were unable to do at first, and write out complete corrections to problems which you did incorrectly. The goals of doing the grading this way are to ensure that you understand each problem fully, and also to give you a "second chance" on problems that you muff. You will then turn in your revised problem set on the following Monday in class. The grader will check over your revisions (using green ink for grading!), and assign the remaining 50% of the grade. In principle, everyone should have a perfect revised version, since you may consult the skeleton solutions as needed in preparing this.

To make this whole scheme work, it is essential that you leave space on your problem set to write in corrections. You may wish to leave space at the bottom of each page, or to use the back of the preceding page.

There will be no rewrite on the final assignment, since it will be due on the last day of classes.

You will be graded on the presentation and comprehensibility of your assignments. This does not mean that we require you to have neat handwriting! However, we do expect you to make an effort to make your writing legible. Perhaps more importantly, we expect you to present your problems in a logical and easy-to-follow manner. The grader will mark with a circled "P" (for "presentation") any problem which is not presented clearly. You will receive a one point deduction for each P. (A typical problem or significant subpart of a problem is worth 2 or 3 points.) **For the first two assignments, no deductions will be taken for P's.** This will give you a chance to get used to our expectations. **If the reason you got a P for any problem is unclear, please see me about it.**

• Exams--understanding is the key. Partial credit will be given for sensible efforts even without a completely correct answer. We will also use a two-pass system for the two mid-term exams, with 60% of the weighting from the first pass and 40% from the second pass. The first pass will be closed book and timed, while the second pass will be open book and untimed. (You are not allowed to consult any human other than me for the second pass.)

• Laboratory--the grading of your work in the laboratory will be discussed separately at the first lab session.

• Your final course grade will be computed using the following weighting

First exam	13%
Second exam	17%
Final exam	22%
Laboratory	20%
Written exercises.	25%
Final project	3%

Late policies:

- Labs must be done on the scheduled date unless cleared in advance by the lab instructor or department assistant.
- For weekly homeworks, you are permitted two 1-week extensions (either on a first pass or on a second pass) without any penalty during the semester when you are stressed out with work. Just turn in a sheet of paper indicating that you are giving yourself a "free extension." The two extensions must be used for separate problem sets; they cannot be combined to get a two-week extension on one problem set.

  If you take an extension on the first pass, you automatically receive a one-week extension on the second pass as well, without this counting as your second free extension. You may not consult the skeleton solutions on your first pass, but must wait for the second pass (just as if you had not taken the extension). Also, you may not consult the complete solutions until after you have turned in the second pass.

  Save these extensions for when you really need them. I will only grant additional extensions for truly grave cases, such as a death in the family or severe illness; such extensions must be asked for in advance. Other than these extensions, work turned in late will not be graded.
- Exams must be turned in not later than the stated times, except by prior agreement.

Honor code matters:

We value Haverford's honor code for the integrity it fosters and the pedagogical flexibility it affords. The important guiding principle of academic honesty is that you must never represent the work of others as your own. The following guidelines should govern your behavior in the course; please request clarification if you find yourself in any doubtful situations.

- You may seek assistance from the instructors, at the Physics clinic or from your fellow students in doing the weekly assigned exercises (except for “individual problems”) but *only after attempting each problem yourself*. (Discussion *without* prior effort, except to clarify what the question is asking, is not permitted.) You may work together with other members of the class on these assignments and this is often quite beneficial. For your own good, avoid situations in which you are either contributing either too much or too little to such collaborations. Do not work in groups of more than five people; three or four is usually ideal. Just copying someone else's work is clearly a representation of another student's work as your own and is a violation of the Code.

  You may consult with me about any problem (including individual problems), but again only after attempting it yourself.

  Your textbook gives the answers for most of the odd-numbered exercises. These are given so that you will know if you have done a problem correctly. It is not sound learning procedure to try to work backwards from given answers, but doing so is not a violation of the honor code.
- Solutions to the written exercises will be made available on the due date . (If you are doing a late set, you may consult the solutions, but you may not copy them. However, we encourage you strongly to give the problems an honest effort on your own first, so as to learn from them most effectively.)

- The take-home exams must be entirely your own work. Detailed instructions will be given on the exams themselves and discussed in advance. You will be allowed to use a page of notes prepared in advance, and a calculator, but no other materials. No collaboration of any sort is allowed once you start an exam. The allowed time (a single contiguous block) must be strictly observed.
- I will be re-using some materials from previous years. Therefore, you are not allowed to look at materials from previous years. I will provide plenty of practice questions to help you prepare for the exams.
- You may not share materials distributed in this course or recordings of my lectures with anyone outside this course.
- Honor code guidelines for the lab are contained in the lab manual.

Advice

You may need to improve your study habits in order to do well in this course. The following suggestions are based on the experience of previous students:

Review your class notes between lectures, and come prepared to ask questions. *Annotate* your class notes as you read them.

Stay up to date on the reading; preferably read the assigned material *twice*; for example, once before the relevant lecture, and once after.

Read with pen in hand to work out things described only briefly in the text or lecture. Ask yourself "what is the main point of each section", and *answer* the question.

When you take notes in class, *don't just write down equations*! Qualitative information is often essential!

Don't spend more than 1 hour on a single homework problem. Show clearly where you're stumped and just move on. Don't feel badly if this happens occasionally, or worry about the effect on your grade. Consistency in doing the homework is more important.

You need to allocate about 7 hours for study and homework per week (plus class time and lab responsibilities).

Do stop in to see one of us if you have questions or suggestions.

When you're studying for an exam, review the *solutions* to problems and previous exams.

Remember that if the material is a new or unfamiliar for you, learning will take time, just as learning a new language takes time Try not to become discouraged if the going is rough at times, and don't prejudge your ability to master the material. Generations of students have done it before you. There is no magic method of presenting the material that we can use to make it easy.

Students who think they may need accommodations in this course because of the impact of a disability are encouraged to meet with me privately early in the semester. Students should also contact Rick Webb, Coordinator, Office of Disabilities Services (rwebb@haverford.edu, 610-896-1290) to verify their eligibility for reasonable accommodations as soon as possible. Early contact will help to avoid unnecessary inconvenience and delays.

Exam Schedule:

Exam 1 will be distributed 2/14 and due 2/18; Exam 2 will be distributed 4/4 and due 4/8. The final exam will be held during finals week. (!) **Note that the amount of new material covered on the second exam is greater than the first exam.** Plan your study time accordingly! (The weights assigned to these exams have been adjusted accordingly.)