

**Haverford College - Physics Department**  
**Physics 106b: Fundamental Physics II**  
**F. Crawford**  
**Spring 2005 General Course Information and Policies**

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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 pre-requisite for this course.

The spring semester of the sequence (Physics 106) covers electricity and magnetism, electric circuits, optics, and special relativity. The physics of electricity and magnetism underlies many of our recent technological advances (data storage, electronic computers, television, etc.); electromagnetism is also the fundamental force which governs chemistry, and it is one of the building blocks of our understanding of many astrophysical systems. We will consider the ideas of Maxwell, Faraday, and Gauss among others. Our treatment of optics will include modern optics (e.g. interference and diffraction). Finally, we will study special relativity, which is critical to understanding high speed motion, and which may 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 generally rely heavily on the textbook, so be absolutely certain to keep up with the reading, or you will be unable to get the full value from the class meetings (and, worse, you could eventually become hopelessly lost in the course). 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 in the evenings before homework is due, a physics tutor if necessary (through the Dean's office), your classmates, and me. You will find the class rewarding and a good experience if you invest the necessary work in the course. I will do everything in my power to teach you efficiently and to reveal the fun side of physics.

## Location and Times

- **Lectures:** MWF 11:30 - 12:30 in Koshland INSC Hilles H108.

It is essential that you come to all classes (and participate!) 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. Experience with earlier generations of students shows very clearly that students who frequently skip class learn very little and do very poorly. All absences, for any reason (including illness, athletic events, etc.) should be discussed *in advance* with the instructor. Excessive absences can result in a grade of "Incomplete". Also, please try to come to class on time since I sometimes make announcements at the start of class.

- **Labs:** Tue or Wed 1:15 - 4:00 p.m. in Koshland INSC Hilles H105.

You will be assigned to either Tue or Wed on the basis of a form to be filled out in class. You may not switch sections without approval, since we need to keep the sections approximately equal in size for logistical reasons. The laboratory does not meet every week; a schedule is contained in the lab manual and is posted on the lab web page (linked from the course web page). 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. *All labs must be completed and all lab reports turned in satisfactorily in order to pass the course.* You will only be able to complete the lab in the allotted 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.*

- **Physics Clinic:** An optional Physics Clinic staffed by experienced and friendly physics majors will be run weekly on Wednesday and Thursday evenings from 7:00 - 9:00 p.m. in the Physics Lounge, Koshland INSC Hilles H107. This clinic is a valuable resource for clearing up confusing issues from class and for getting help with the homework.
- **Course Web Page:** [http://cs.haverford.edu/people/fcrawfor/teaching\\_spring\\_2005\\_p106.html](http://cs.haverford.edu/people/fcrawfor/teaching_spring_2005_p106.html)  
You can also access this page through links from the Haverford physics department web site. Assignments and announcements will be posted here, so please check it regularly. The lab web page (which has the lab schedule) is also linked from this page.

## Instructors

**Lecturer and Lab Instructor:** Fronefield Crawford  
**Office:** Koshland INSC Link L106  
**Phone:** (610) 896-2973 (office)  
**Email:** fcrawfor@haverford.edu

**Lab Instructor:** Scott Shelley  
**Office:** Koshland INSC Link L207  
**Phone:** (610) 896-1310 (office), (610) 649-6671 (home)  
**Email:** sshelley@haverford.edu

Office hours will be announced shortly after the start of the course. You can also just stop by my office at other times; my door is usually open (although before class is usually not a good time since I am getting ready for class).

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 me as *soon* as possible. A good way to get together is to arrange a mutually agreeable time, either by email or in person after class. I expect you to read your email and check the web page regularly as I will make announcements and answer some questions in this way. You should feel free to send email when you have a question or comment.

**Feedback:** I will issue course evaluations part-way through the semester. However, if you have concerns about the course or ideas about how to make it better, you should let us know immediately, either in person or by email. Don't wait!

## Textbooks and Supplies

- *Physics With Modern Physics for Scientists and Engineers (third edition)* by Wolfson & Pasachoff is the required text. This text is available in the bookstore; you can shop around for used copies, but be sure the edition is the same. Study guides, etc. are optional.
- You will also need to purchase a laboratory manual for this course from Scott or the bookstore. All other supplies needed in the laboratory will be provided.
- A pocket calculator will be needed for problem sets and tests and in the laboratory.
- A selection of other texts and useful references is on reserve in the Science Library in the INSC.

## Assignments

Written work will be assigned weekly, and is due at the start of class on the assigned date (ordinarily the next Friday). Assignments will usually be posted electronically on the course web page for download. Some assignments may include "individual" problems. It is expected that you will work on these problems without collaborating with other students and without getting help at the clinic. You may ask me questions concerning these problems, either in person or by email.

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 are 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 have figured out the correct way to do them.

There will also be assigned reading before each class to prepare you for class discussion. These readings are listed on the course schedule.

## Tests

There will be two take-home midterm exams plus a self-scheduled final exam. Exams will be cumulative and will cover both concepts and problem solving. Time pressure in exam settings, while not my goal, 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.

## Grading

Midterm Exam 1	13%
Midterm Exam 2	17%
Final Exam	20%
Laboratory	20% ( <i>Note: ALL labs must be completed to pass the course!</i> )
Homework Assignments	25%
Participation and Attendance	5%

## Late Policies

- Labs must be done on the scheduled date unless cleared in advance by the lab instructors. Individual experiments are not kept set up after the week in which they are used.
- The following late penalties will be in effect for homework. You are permitted *three 1-week extensions without any penalty* during the semester. Just turn in a sheet of paper, or send email to me (Fronney) indicating that you are giving yourself a free extension on a particular problem set. The three extensions must be used for separate problem sets; they cannot be combined to get a three-week extension on one problem set. Save them for when you really need them. Other than these extensions, work turned in late will not be graded. Exceptions will be made only for truly grave cases; such extensions must be asked for *in advance*.
- Exams must be turned in not later than the stated times, except by prior agreement. You may get an extension on an examination **ONLY** with a Dean's excuse.

## 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 and preparing for class discussions (except in the case of "individual" problems). You are also encouraged to 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. *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. This applies to copying down results worked out on a blackboard by other students as well as solutions written down on paper.*

- Solutions to the written exercises will be made available on the due date. (If you are doing a late set, after one week 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. Copying a solutions set slavishly IS a violation of the Honor Code.)
- *Take-home, in-class and self-scheduled exams must be entirely your own work.* Detailed instructions will be given on the exams themselves and discussed in advance. You must use only those materials allowed in the instructions given on the exam. No collaboration of any sort is allowed once you start an exam. The allowed time (a single contiguous block) must be strictly observed. 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. When you take notes in class, *don't just write down equations!* Qualitative information is often essential!
- *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. Highlighting the text as you read is no substitute for this exercise in thinking and reinterpreting what you have read!
- *Make drawings* of the physical situations we discuss in class or the ones you encounter in problem sets (and real life!). This helps you understand just what is going on much more than merely thinking about it.
- Don't spend more than one hour on a single homework problem. Show clearly where you're stumped and just move on. Don't feel bad if this happens occasionally, or worry about the effect on your grade. Consistency in doing the homework is more important.
- Try the homework problems first yourself, but do get help in clinic or from me if you need it. That's why these resources are provided. We expect you will make use of them as one more learning tool.
- You need to allocate about seven hours for study and homework per week (plus class time and lab responsibilities). This isn't merely a time budget. It's also how much time you need to allow the ideas and methodology to really sink in so that you have truly mastered the subjects.
- Do stop in to see one of us if you have questions or suggestions.
- When you are studying for an exam, *first* perform new problems and redo as many old problems as you have time for. Only after you have done so is it a good idea to *then* review the *solutions* to problems and previous exams. You always learn more from engaging in problem-solving than reviewing how someone else (even yourself in a previous week!) solved a problem.
- Study for the exams *in advance*. Your brain tackles problems differently if you have given it time to mull over new material and new approaches to problem-solving. You really think differently (and better) once you have literally slept on new ideas.
- Remember that if the material is 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.