Physics 122, Fall, 2003-2004

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1 Course Material/Syllabus

This course is designed to give you a basic background in the study of the phenomena of electricity and magnetism as well as a flavor of some basic applications. You will be responsible for material in the assigned readings and the lectures.

A list of topics and (roughly) what lectures they should be covered in follows below. I will try to protect two full lectures for review at the end, but can't promise this.

- Electrostatics (Lectures 1 8)
 - Electric charge, Coulomb force, Electric Fields, Conductors
 - Electric dipoles
 - Gauss' Law (Integral form)
 - Electrostatic Potential and Energy
 - Capacitors and Dielectrics
- Electrodynamics (Lectures 9 11)
 - Currents, Resistance, Ohm's Law
 - Resistive Circuits
 - RC Circuit Phenomena
- Magnetic Fields (Lectures 12 15)
 - Magnetic Fields and Forces, Lorenz Force
 - Currents and Magnetic Dipoles
 - Ampère's Law
 - Biot-Savart Law
 - Magnetic Materials, Dia-, Para- and Ferro-magnetism
- Magnetic Induction (Lectures 16 18)
 - Induced Electric Fields, Faraday's Law
 - Mutual and Self Inductance, Inductors, Transformers
 - LR and LC Circuits
- Simple AC Circuits (Lectures 19 21)
 - AC voltage and current
 - Impedance and Phases
 - Simple AC Circuits and Applications
- Unification of Electricity and Magnetism (Lectures 22 24)

- The Displacement Current
- Maxwell's Equations (Integral form)
- Electromagnetic Waves
- Light: Speed, Energy, Momentum
- Wave and Particle Properties of Light
- Review (Lectures 25 26)

We will not explicitly cover material assumed as prerequisite for this class, including vectors and integral and differential calculus (material through (Math 143 or Math 162 or equivalent), and mechanics (Physics 121 or equivalent), although we will frequently make reference to and use of this material. If you are unsure if your background meets the course prerequisites, please see me.

2 Texts and Other Course Materials

One text is required: <u>Physics for Scientists and Engineers</u>, Volume 2, 3rd ed., Douglas C. Giancoli. Material for this course is covered in Chapters 21–32. Your text should have been packaged with a "Student Study Guide and Solutions Manual", which contains some review material and solutions to selected problems in the text.

Other material will be available on the course home page,

http://www.pas.rochester.edu/~ksmcf/p122

3 Lectures

Physics 122 lectures are given Monday and Wednesday at noon - 1:20 pm in Hoyt Auditorium.

I will make every attempt to hand out lecture notes to you before each class to relieve you of some of the mechanical burden of note-taking and leave you free to think and question as we go.

I will frequently interrupt the lecture and associated demonstrations with "concept" questions. I ask you to please pick up an answer recording sheet before class to (anonymously if you wish) record your initial guesses, final answers and any comments or questions you may have on the problems.

The back of these sheets is a feedback space, where you can (again, anonymously if you wish) ask questions you didn't want to or have time to ask in class and give me feedback about any aspect of the course if you wish.

Each lecture after the first will start with a question time, where I will answer questions from the feedback sheets, e-mail, one-on-one conversations and in-class questions that you may have based on material from the previous lecture. (n.b., if you wish to ask a question that you do *not* want me to share as an example in class lecture for whatever reason, I ask you to please indicate this to me explicitly.)

You should feel free to also interrupt lecture with questions. I will try to answer as many as I can in our allotted time.

Announcements, such as schedule changes or other news germane to the course, will be made in lectures. (Schedule changes relevant to laboratories or workshops may be made in, laboratories or workshops themselves.) Although I will attempt to keep current news on the course web page as well, once an announcement is made in one of these locations, it is your responsibility to know and understand these announcements.

4 Workshops

For better or worse, your evaluation in this course will be primarily based on your ability to synthesize the material and apply it to problems on examinations and in homework. It is almost impossible, even for the future Albert Einsteins among you, to do this well without practice, practice and more practice. Workshops provide a way to work in small groups with your peers in a forum where you can get instant feedback and help from your workshop leader (a teaching assistant or teaching intern for the course).

At each two hour weekly workshop session, you will be presented with a number of conceptual and traditional problems, similar to what you might expect to face on an exam. You and your fellow students in the workshop will have a chance to work through these problems and identify any misunderstanding or confusion that might impede you in solving the problems. I strongly encourage you to take these sessions seriously, and to prepare in advance by reviewing the material and the problems. Workshops will cover material through the *Wednesday lecture* of the week of the workshop.

4.1 Workshop Signup and Schedule

Workshops begin the week of Wednesday, September 10 - Sunday, September 14, and conclude with a review workshop Wednesday December 10 - Sunday, December 14.

Workshop CRN/Time/Place			W	Workshop CRN/Time/Place		
45530	Wed 2:00-4:00pm	B&L 372				
45608	Wed 5:00-7:00pm	B&L 108				
45624	Wed 5:30-7:30pm	B&L 208	45337	Fri 1:00-3:00pm	B&L 269	
45594	Wed 7:00-9:00pm	Hylan 206	45567	Fri 2:00-4:00pm	B&L 108	
			45575	Fri 4:00-6:00pm	B&L 108	
45453	Thur 11:00-1:00pm	B&L 208				
45435	Thur 2:00-4:00pm	Latt. 107				
45371	Thur 2:00-4:00pm	B&L 208				
45529	Thur 3:00-5:00pm	B&L 108				
45631	Thur 4:00-6:00pm	Hylan 618	45645	Sun 2:00-4:00pm	B&L 108	
45497	Thur 5:00-7:00pm	B&L 108				
45613	Thur 5:00-7:00pm	Hylan 206				
45358	Thur 6:00-8:00pm	B&L 173				

Web-based sign-up is first-come, first-served.

https://spider.pas.rochester.edu/signup/PHY122-F03Workshops/

5 Labs

There is a required lab component for this course which is administered separately from the rest of the course. Information about the labs, including the laboratory section signup, is available at

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http://web.pas.rochester.edu/~physlabs/
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There are five required labs, approximately one for every other week of the course.

- Coulomb's Law
- Absolute Electrostatic Potential
- Electron Beams
- Superconductivity and Ohm's Law
- Electronic Circuits

Each lab activity consists of pre-lab homework, the lab activity itself, and a lab report which is completed during the lab section.

6 Exams, Homework and Grading

There will be four midterm examinations (each 60–90 minutes) and a 150 minute final exam. The midterm examinations are tentatively scheduled for Tuesday, September 23rd, 7:30-9:10pm,

in Hoyt Auditorium, Tuesday, October 14th, 7:30-9:10pm, in Hoyt Auditorium, Tuesday, November 4th, 7:30-9:10pm, in Hoyt Auditorium, Wednesday, December 3rd, 12:00-1:20pm, in Hoyt Auditorium. The final is tentatively scheduled for Wednesday, December 17th, 8:30am.

The material on the midterm exams will cover course content through that covered in the previous weeks' lectures and workshops. All midterms are "cumulative" in the sense that early material is fair game, but the focus will be on material after that covered in the previous exam. The final examination will be the most comprehensively cumulative, but will include extra emphasis on the material at the end of the course not covered in any previous midterm.

As a very wise eight-foot tall philosopher with yellow feathers once said "everyone makes mistakes" to which his acolytes replied "oh yes they do". I therefore reserve the right to add points in a uniform way to all exam scores ("grade on a curve") after the fact. This "curve" will never lower your grade, so if my mistake is to give too easy an exam, consider it your collective lucky day.

In this same spirit, of the four midterm examinations, only the three most favorable will count towards your grade. If you are missing some basic knowledge, or a key concept, or just have a "bad test day", think of this as your free wake up call. Alternatively, if you ace all four midterm exams and don't do as well on the final, I will substitute "one midterm worth" of grade from the midterms for your final grade. Again, this procedure can never lower your final grade, but may raise it.

Makeup exams will, in general, not be given. Anyone who misses an exam without first making arrangements with me (Prof. McFarland) will receive a grade of 0.

6.1 Homework

Homework sets will be assigned most but not all weeks. Typically they will be assigned on Wednesday and due the following Wednesday at 8am. Material covered in the homework will be the same material covered in the workshops the week the homework is assigned.

Homeworks will not usually be fully graded, but rather spot checked and graded on a pass/fail basis. (The intent is to check for a serious effort to do the homework by applying standards set by a consensus of the TAs and the instructor.) It is your responsibility to make sure you can do **all** of the homework problems and to get the appropriate help in lecture during question time, in workshop sections, during TA help sessions or instructor office hours. No late homework will be accepted.

For "paper-based" problem sets, you may and are encouraged to consult with each other and work in groups on homework; however, each student is expected to turn in his or her own work. The completed homework paper assignments are to be placed in the locker labeled **P122** located on the east side of the 1st floor of B&L outside room 106. Solutions will also be available on reserve in the Physics and Astronomy library on the 3rd floor of B&L. You may pick up your graded paper homework from a homework box outside of my office.

6.2 Participation in Workshops and Pre-lecture Reading ("Preflights")

Workshop participation is required in this course. Accordingly, I will ask your workshop leaders to keep track of participation, and this will be a (small) part of your final grade. Note that confusion and misunderstandings are not anathema to participation. However, sleeping through workshop does not count as participation.

Pre-lecture reading is also a requirement of the course. As a check on your reading and a feedback mechanism for me, I will ask each of you to complete "pre-flight" questions following your reading. Pre-flights are due by 8am the morning before each lecture. These will be computer-based questions, and your participation will count as a (small) part of your grade.

6.3 Grading

Your course grade derives from the weighting:

Homework	10%
"Preflight"s & Workshop Participation	10%
Laboratory	10%
Midterm Exams (total)	40%
Final exam	30%

I reserve the right to change this grading scheme, but I will notify you as soon as possible if such a change takes place.

I plan to use the following grade scale on a 100 point scale: 85-100: A or A-; 70-84: B+, B or B-; 55-69 C+, C or C-; below 55 D or F. I reserve the right to lower the standards for a given grade (e.g., I may announce that I will make 83 the lowest A), but I will not revise the scale upward.

6.4 Extra Credit for Outstanding Participation

I will also offer spontaneous credit for exceptional class participation during lecture ("for the A"). If I tell you during class that you are awarded an "A" for your participation, it is your responsibility to deliver to me immediately after class a small sheet of paper with your name and a description of why the "A" was awarded. An "A" will add 1/2 point to your overall score for the class. "A"s may be given for insightful questions as well as thoughtful answers; the hallmark of exceptional participation in class is your engagement and grasp of the material. Sometimes that means knowing the right answer; sometimes it means knowing the right question.

6.5 Academic Honesty

Sadly, I have yet to teach this course and not have questions regarding academic honesty arise. Please take a moment to read through what I have to say so we are on the same page on this important subject.

I expect all students in this course to adhere to the College guidelines on academic honesty. In particular, unless I state otherwise (e.g., written homework assignments), work submitted by a student for a grade in this course is expected to be that students' work and solely his or her work. I will specify explicitly guidelines for student conduct during examinations (e.g., what materials you are allowed to bring to the exam), and I expect you to adhere to guidelines scrupulously.

Suspected violations of the College policy on academic honesty, including but not limited to those above, will usually be referred to the College Board on Academic Honesty. If the Board rules that a violation of the policies has occurred, the possible remedies may involve a grading change.

7 Physics 122 Student Resources

No one would claim that this is the easiest material in the world. Accordingly, the instructional resources of the course are being heavily weighted to provide you with one-on-one or small group help outside of the traditional lecture format.

- Workshops
- Professor McFarland's office hours
- TA office hours
- In-lecture question time
- To be announced later in the term: SPS (Society of Physics Students) free tutoring sessions

It is your responsibility to take advantage of these opportunities as you need them. You should also recognize that this is a large class, with a finite number of TAs and instructors, and that there may be a large demand for help shortly before exams. I advise you to plan accordingly, and address conceptual problems when they first arise in your mind.

To help specifically around the times of exams, I will attempt to schedule several review sessions throughout the term.

7.1 Professor McFarland's Office Hours

I will have office hours on Tuesdays from 10am - 11am, Wednesday 2-3pm, or by appointment. You may also drop by my office, but there is the risk that I may be gone or have a previous commitment. If I can talk with you, however, I will.

I often travel out of town to do research on Thursdays and Fridays, and you should not count on finding me at Rochester on those days unless you have a previous appointment.

7.2 Your Teaching Assistants and Interns

ТА	Office	Phone	E-mail				
Graduate Teaching Assistants							
Curtis Broadbent	B&L 208B	x5-4619	curtis@pas.rochester.edu				
Ben Pearson	B&L 478	x5-0339	pearson@pas.rochester.edu				
Ross Robinson	B&L 208B	x5-4619	robinson@pas.rochester.edu				
Gustaf Sterner	B&L 478	x5-0339	sterner@pas.rochester.edu				
Undergraduate Teaching Interns							
Bob Forties	B&L 466	x5-7374	rf002k@mail.rochester.edu				
Zhuohan Liang			zl010j@mail.rochester.edu				
Josh Veazey	B&L 485	x5-7162	jv006j@mail.rochester.edu				

7.3 TA/TI Help Sessions

The TAs will hold office hours beginning September 8^{th} until the final exam.

Help Sessions

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Monday 1:30-2:30pm	B&L 208B				
Tuesday 2:00-3:00pm	B&L 208B				
Tuesday 4:00-5:00pm	B&L 478				
Friday 1:00-2:00pm	B&L 478				