

## PHYS 122: General Physics II: Electricity and Magnetism

January 12, 2009

- Content:** Electrostatics, Electric Fields, Potentials, Magnetic Fields, Circuits, Electromagnetic Induction, Capacitance, Electromagnetic Waves, Optics
- Prerequisites:** Physics 121, 123, or Equivalent
- Schedule:** Lectures: M W F 9:30 to 10:20 AM in Strosacker Auditorium, Case Quad  
 Optional SI Sessions: Schedule TBD: (Probably Tuesday and Sundays)
- Labs: *Required. every other week*  
 Student *must* register for labs. See Diana Driscoll: did2@cwru.edu
- Instructor:** Corbin Covault  
 Rockefeller 207  
 Phone: 216-368-4006  
 Cell: 216-496-2077  
 E-mail: corbin.covault@cwru.edu
- Course Web Page:** <http://www.phys.cwru.edu/courses/p122>
- Lab Web Page:** <http://physicslabs.phys.cwru.edu>
- Required Texts:** Physics for Engineers and Scientists, 3rd Ed., Vol. 2, by Ohanian and Markert  
*E&M Laboratory Manual (Coursepak)* (from CWRU Bookstore).
- Recommended:** *Clicker: Interwrite “Cricket” (RF)*
- Homework:** Due weekly most *Mondays by 4:00 PM sharp*.  
 12 assignments, lowest two scores will be dropped.  
 Homework solutions done by instructor, posted on the Web.  
*No late homework will be accepted under any circumstances.*
- Workload:**
- |                              |      |
|------------------------------|------|
| Homework                     | 20%  |
| Laboratory*                  | 20%* |
| 1st hour exam (Fri Feb 06)   | 5%   |
| 2nd hour exam (Fri Mar 06)   | 10%  |
| 3rd hour exam (Fri Apr 10)   | 10%  |
| Final exam (Mon May 04, 4PM) | 35%  |

\*Note: Lab are administered and graded separately

## Syllabus Schedule:

Here is an *approximate* syllabus (schedule) for the course (subject to modification in the reading assignment). Depending on the interests of students in the class and the tenor of discussions, we may spend more or less time on any of these topics. For this table, I count fifteen weeks in the class and label each week by the date of the Monday on that week. **Note the dates indicated for the exams are fixed.** Note that every Monday you have a homework due *unless* you took an exam the previous Friday. Also dates where no class will be held are also indicated:

	<b>Monday</b>				
	<b>Wk</b>	<b>Mon Date</b>	<b>Homework Due?</b>	<b>Content Topics</b>	<b>Important Dates</b>
Cycle 1	1	Jan 12	None	Charges, Fields	
	2	Jan 19*	HW#01*	Circuits, Magnetism	<b>No Class: Mon Jan 19</b>
	3	Jan 26	HW#02	Light	
	4	Feb 02	HW#03	Gauss' Law, Voltage	<b>1st Exam: Fri Feb 06</b>
Cycle 2	5	Feb 09	None <sup>†</sup>	Time-varying circuits	
	6	Feb 16	HW#04	Ampere's Law, B-Fields	
	7	Feb 23	HW#05	Waves, Interference	
	8	Mar 02	HW#06	Fields and Energy	<b>2nd Exam: Fri Mar 06</b>
		Mar 09		<b>SPRING BREAK</b>	<b>Mar 9-13 No Labs, No Classes</b>
Cycle 3A	9	Mar 16	HW#07 <sup>‡</sup>	Conductors, etc.	
	10	Mar 23	HW#08	Capacitor, Inductors	
	11	Mar 30	HW#09	Faraday, Lenz	
	12	Apr 06	HW#10	Maxwell's Equations	<b>3rd Exam: Fri Apr 10</b>
Cycle 3B	13	Apr 13	None <sup>†</sup>	Polarization, Optics	
	14	Apr 20	HW#11	Quantum Theory	
	15	Apr 27	HW#12	<b>Apr 28 last day of class</b>	<b>Reading Days, Apr 29, 30</b>
		May 02		Final Exam Review	1 PM to 5 PM Sat May 02 <sup>‡</sup>
		May 04		<b>Final Exam</b>	<b>4 PM to 7 PM Mon May 04**</b>

\* First Homework is due **Wednesday, Jan 21st** due to MLK holiday.

<sup>†</sup> For weeks with no homework due, Optional Problems will be offered.

<sup>‡</sup> Homework #07 is a special assignment, and can be submitted any time before March 8.

<sup>‡</sup> Review session is tentatively scheduled for this time.

\*\* All students **must** sit for the final exam to earn a passing grade.

For summary descriptions of Cycles, details on Lectures, Homeworks, Exams. Labs, Office hours, etc. see following pages....

## Goals of the Course:

Introductory physics courses are “historical beasts”. This is to say that their content and design are largely dictated by tradition and precedent. The content of any introductory course in electromagnetism will not vary much from place to place. But the emphasis and approach to the content may vary considerably, and the whole enterprise is complicated by the fact that there is really a very wide range of topics that might be included in this class. Therefore it is worth considering the purpose and philosophy and goals of the course. As instructor, I will design the course so that the students can achieve these goals. This will give more focus and direction to the course than simply trying to “cover the material”.

The main goals of Physics 122: Electricity and Magnetism are as follows:

- To reinforce in students the formal method of investigating the world through physical sciences, and in particular, to have students learn for themselves how physics as a discipline can be used to obtain a deep understanding of how the world works.
- To have students understand the basic concepts of electric charge, electric current, and electric and magnetic fields,
- To have students understand how charges and currents respond to electric and magnetic fields and also how charges and current generate electric and magnetic fields,
- To have students learn practical fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity and magnetism both in static and time-varying scenarios,
- To have students comprehend how all of the individual laws and observations regarding electricity and magnetism were unified by Maxwell into a theoretical framework that also precisely describes visible light and all other forms of electromagnetic radiation, and
- To have students learn a range of methods for applying these understandings and problems toward solving a broad range of physical problems with precision.

In addition the laboratory component of the course has the following overall goals:

- Students should be able to perform introductory physics experiments (verify experimentally physics concepts learned in lecture, operate and troubleshoot some experimental equipment, collect experimental data using computer interfaces, analyze data and interpret results, propagate errors and understand differences between random and systematic errors, standard deviation and standard error)
- Students should be able to write lab reports in a professional self-contained, publication-like format (independently write up a report after having collaborated with lab partners in performing the experiment and the analysis).

## P122: Using a Cyclic Approach:

The topic of introductory physics has been taught in more-or-less the same manner in colleges and universities across the country for decades. Specifically, for Electricity and Magnetism, the material is traditionally presented in a *linear* fashion, starting with Coulomb's Law, defining a field, etc. Each topic is introduced and then expanded upon fully before moving onto the next topic.

Pedagogically, the difficulty with the traditional approach is that students will generally cover a given topic only *once* in a semester, and – without re-visiting the topic – even students who do well on exams tend to *lose comprehension* later in the semester or even in future courses. In a nutshell: the material does not “stick”.

This pattern is not surprising when we consider what is known about how most people learn. The human mind is not a “blank slate”, and people generally do not learn any any level of depth through a single exposure to a topic. Rather, material is learned through repeated exposure to ideas, re-visiting and expanding at several different points and different times. Generally speaking, we need to see it, reflect on it, act on it, and then see it all over again before we really learn it.

To help students deepen learning in the course we are using a *cyclic syllabus* to Physics 122. The basic idea is that the course is divided into three *cycles*. During each cycle we will cover the content of the entire course, from charge to optics, followed by an exam. However, during each subsequent cycle we will look more deeply into the content topics.

For example, during the *Cycle 1* we will introduce the idea of point charges and we will consider simple fields that result from simple charge and current configurations. We will barely allude to the concept of electric potential, before moving into applications in circuits. During *Cycle 2* we will look in more detail at the mathematics of charge and current distribution, developing a formalism for surface flux and integrals. During *Cycle 3* we will take these idea further with a complete description of Maxwell's Laws and consideration of time-varying currents and physical optics. In other words, we will see the same topic three times, each time revisiting what we learned previously before adding further details to increase the depth of our understanding.

This approach has many advantages, but one disadvantage is that the presentation of materials is *not* closely linked to the content and organization of *any* commercially available textbook. We will be using the text *Physics for Engineers and Scientists, Third Edition, Volume 2* by Ohanian and Markert for reading. But the reading assignments will “jump around the textbook” so as to match the presentation of materials in class. For those of you who are used to moving linearly through an assigned text, this will be a rather different experience.

We will provide several different mechanism to help students keep track of “where we are” in the course, regarding the Cyclic Syllabus as follows:

- We will hand out and post on the Web Page a “concept map” that shows which topics we are covering during each week of each cycle. This will be updated as needed.
- The *lectures* define content of the course, not the textbook. Therefore copies of notes will be provided for *some* lectures to students online. **Note: Unlike Physics 121 Fall 2008, there**

**will not be a comprehensive set of online notes.** To help encourage students to keep up with the reading, a series of *optional online reading quizzes* will be given to students.

- On an occasional basis, short documents, called “Review Sheets” will be presented to the class which delineate the scope and depth of key topic areas for students. These Review Sheets will be specifically designed to let students know which topics they are responsible for in advance of each exam.
- Generally, every lecture will be videotaped and available for viewing online afterward by any student at any time during the course. Video taped lectures will be organized and sub-indexed by topic.
- Example practice problems that delineate the scope and level anticipated for exams will be presented frequently, sometimes in lecture, sometimes online. Solutions will be posted on the web page.
- During some lectures, student will be presented with practice conceptual problems and will be asked to response using a “clicker” system. Solutions to these problems will be presented in class and archived on the web page.

### **Who should take this course:**

Physics 122 (together with Physics 121) is one of three “main sequence” introductory physics courses that will satisfy general university requirements for physical sciences and specific requirements for many departments. The three courses are Physics 115-116, Physics 121-122, and Physics 123-124. The physics department maintains a nice description of all of these on it’s webpage: <http://www.phys.cwru.edu/undergrad/>

Students are often concerned about which of the three sequences is best for them. Ultimately, this is a decision that should be worked out by each student in consultation with his or her adviser. But here are some possibly helpful notions regarding this question from my perspective as an instructor:

Physics 121-122 is the “regular” introductory sequence and therefore it is designed to be suitable for students with a wide range of background, interests, and future plans. As a rule of thumb, if you are unsure which of the three introductory physics sequences you want to take, Physics 121-122 is probably the one you want. Note that all three sequences cover the same content. If you look at the syllabus of topics covered in each class, they are virtually the same. The main difference between the sequences is the level of mathematical sophistication that is assumed on the part of the students when dealing with problems. For Physics 121-122 we assume that students have taken or are currently taking calculus. Calculus will be used in P122. But when we use it we will sometimes take a little time to review the materials, and we will especially take our time reviewing the application of calculus to problems involving fields and vectors, since these topics are not often covered in detail in first year calculus courses.

On the other hand, students who have a strong mathematics background might consider taking Physics 123-124. In this course, it is assumed that students are quite familiar with vector calculus manipulations.

Going the other way, calculus is used relatively infrequently in Physics 115-116. Physics 115-116 is specifically geared toward students who are considering careers in one of the medical or health science professions. There is some extra emphasis on topics like fluid dynamics. This sequence is not normally available to first-year students.

In my opinion physics 122 is an excellent class for students who are considering *any* major, including *physics* and other physical sciences, engineering, or medical professions.

Finally, a word about majors. Even if you have already have definite plans for your future academic and professional career, you may not have considered this: earning an undergraduate degree in **physics** might be one of the best ways to reach your personal career goals. The physics undergraduate major is a powerful, versatile and flexible degree. Students who go on to careers in engineering, computer engineering and software design, professional school (law, business, startups) and the medical professions are all well-served by a undergraduate bachelors degree in physics. Our undergraduates report a level of satisfaction with their major program that is matched by no other department on campus. The physics department offers several different degree options, to tailor the degree to the interests and needs of the students, including both B.A. and B.S programs, Physics and Math, Physics and Astronomy, and our Bachelor's of Engineering in Physics program, for example. See Mr. Covault if you have questions about this.

## Lectures:

The lectures define the scope and central content of the course. The textbook will be used to support and supplement the lectures. Lectures define the course, not the textbook.

As a study aid, I will on occasion hand out "Review Sheets" that will outline what I consider the most important topics and ideas for each section of the course. I also usually post scanned copies of my lecture notes if I think this would be helpful to students.

**Lectures are Mondays, Wednesdays, and Fridays from 9:30 AM to 10:20 PM.** I will try to start and end promptly. I very much recommend that you should attend the lectures faithfully, paying attention and taking notes when appropriate. There will be occasional lecture demonstrations and interactive activities that will take place during the lecture to reinforce conceptual understanding of the material.

Note that the lectures will be videotaped and archived for online access by the University ITAC Mediavision team. This is a great resource for students to use if they have to miss a lecture because of illness or if you want to see something again a second time. However, I believe that *students who rely heavily on viewing the Mediavision videos instead of personally attending lectures will not perform as well in the class.* The lectures are designed to engage the participants, allow for interaction, and to give a "multimedia" experience applicable to a range of student learning styles. Independent research has shown this: *In classes where students have a choice of coming physically to lecture vs. watching the lecture on video, students who come to lecture perform better in the class.* **So I strongly advise all students to plan their lives so as to be able to get up and into class each MWF morning at 9:30 AM for physics lectures.**

By the way, although the class rather large (at least 215 students) I would very much like to encourage students participation in the lecture. Please feel very free to raise your hand to ask a

question or clarify a point. If you are puzzled, then chances are your fellow students are puzzled too and will be grateful that you asked the question. If I cannot answer your question in class in a way that is relatively brief and helpful to the other students, then I'll promise to respond after class or in a subsequent lecture. If you see me doing something obviously wrong on the chalkboard, make a noise or something so I do not get too far before I correct myself (I do make mistakes!) Also during the class we will often break up the lectures with little "questions" or activities that the students will participate in – usually in groups.

### **Text:**

The "required" text is **Physics for Engineers and Scientists by Ohanian and Markert, Third Edition (Volume 2)**. I've checked and it looks like it is in at the bookstore.

I like this text because it takes a historical approach and because the topic materials are very much in line with the level of stuff I want to present in the course.

*Important:* A reading assignment will be passed out with each homework. In the reading assignment I will try to highlight sections that are important and indicate which sections are less important as well. Since we are using a Cyclic Syllabus this year it will be very important that you follow the reading assignments as assigned. You will find the lectures *much* more helpful if you have read the assigned text in *advance* of the lectures. To encourage you to read ahead of the lectures, we will be offering Optional Online Reading Quizzes where students can earn bonus points for answering questions related to the reading. See the last section on Bonus Points for details.

Note: You are also required to purchase the Department of Physics *Lab Manual* for Electricity and Magnetism (P122). And, if you have not done so already, you will need buy an approved laboratory notebook (one that makes "carbon copies").

Finally, you are asked to bring a "clicker" to every class. Clicker participation is optional but strongly recommended as you can earn Bonus Points (see below). The clicker we are using is the **Interwrite "Cricket" RF** clickers (it has a bright green keypad about \$35 at the bookstore). Another clicker that will *probably* work is the (PRS) IR transmitter (by GCTO). These are no longer for sale, but hundreds of them have been used in the past by previous students in the course so you might be able to get your hands on one. Note that the **I-Clicker (RF) will not work**.

### **Homework:**

The homework is a *very* important part of this course, and will count **20%** of your final grade. Homework will be posted online on Fridays (along with a reading assignment for the coming week. The completed problems will be 10 days later on a **Monday**. The homework may be turned in either Mondays lecture (look for the marked box at the front of the lecture hall) or in marked boxes that will appear outside my office Rock 207 on Mondays. The deadline for submitting homework for any given Monday is 4:00 PM sharp. **Once this deadline passes, the boxes will be closed and homework will no longer be accepted – no kidding here.** If you are someone who will be having a difficult time with this you should make arrangements with a classmate or something. Homework will be graded and returned to you in lecture.

**Here is the deal on due dates for homework:** Homework solutions will written by the instructor and scanned and posted on the course web page to students on the evening they are handed

in. For this reason, and because the pace of the course is relatively fast, *and* because of the very large number of students **no late homework will be accepted under any circumstances**. There will be no exceptions. This sounds really hard-nosed but it is actually pretty straightforward so I hope that students can live with this arrangement.

Having said this, I know that sometimes things happen and there are serious and legitimate reasons why students might not be able to submit homework on time. If you anticipate a personal emergency that might prevent you from handing in your homework on time, then you need to contact me (the instructor) *in advance of the homework due date* to make special arrangements. Likewise, if you are too ill to complete the work, you should notify the instructor. I am open to working out arrangements for students with special problems provided that you come to me *before* homework is due. In this case, usually what I will do is ask the student to agree to complete the homework and then once the homework is completed I will *excuse* that student from that particular homework. If student is excused from an assignment because of a personal emergency then the grade from that assignment will not be counted and instead the total homework grade will be based on the scores of the *other* submitted homeworks. Note that because of the “drop two” policy (see below) I will generally only excuse students from homeworks because of major emergencies or illnesses – events that are completely out of ones personal control. Generally speaking, requests for excuses will need to be made in advance of the due date (when possible) and documentation of the emergency or illness will need to be provided.

**Note: you should always contact the instructor as soon as it seems possible that you might not be able to submit any given homework by the due date as required.** There is no penalty for asking for special arrangements in advance and then subsequently turning in your homework on time. I would much rather handle a potential problem before the fact that turns out to be a false alarm than to deal with a problem after the due date because the student hesitated to contact me in advance. As a rule I am generally sympathetic to making arrangements with students who contact me about potential problems *before* the homework is due. As a rule I am very unsympathetic to students who come to me on the day that the homework is due or later.

**Here is the deal on how homework will be graded:** You will be asked to submit a total of *twelve* homework assignments during the semester. For your homework grade, we will use the top *ten* best homework scores for each student and will *drop* your two lowest scores. I figure that during the semester, a typical student has one unanticipated personal problem and maybe one unresolvable academic conflict that substantially negatively impacts the ability of the student to complete their given homework. By throwing out the lowest two scores, I can account for this and students in these situations do not need to make any special arrangements with me. Note that in any case if you have a genuine personal emergency – something out of your personal control that would prevent you from completing the homework on time – you should contact the instructor in advance as described above.

**Note:** During those weeks where there is an hour exam on Friday, there will be no homework due the following Monday. Instead we will pass out a set of *practice problems* with solutions. Practice problems are completely optional and will not be collected or graded for credit.

**Here is the deal on working with others to get your homework done:** You are allowed and encouraged to work together on your homework. Learning from peers is really one of the best ways

to learn physics. Just *don't over-do it*. You can help each other figure out how to approach each problem, but **you must actually work each problem yourself on the submitted homework!**. Don't let other people do the work for you. You need to learn to do the problems on your own. You can be certain that at least one of the homework problems will appear (perhaps in modified form) on each of the exams. Please do not copy other people's homework. **It is not acceptable to copy another's homework. It is not acceptable to allow your homework to be copied by others.** Copied homework will result in zero credit assigned to both copier and copiee.

### Exams:

There will be a four exams. Please note the dates which I do not anticipate changing:

- **First Hour Exam – Friday, Feb 06 – in class:** Worth 5% of your grade.
- **Second Hour Exam – Friday, Mar 06 – in class:** Worth 10% of your grade.
- **Third Hour Exam – Friday, Apr 09 – in class:** Worth 10% of your grade.
- **Final Exam – Monday, May 04 – 4:00 to 7:00 PM:** Worth 30% of your grade.

Exams will be “closed book” and you will be able to bring one sheet of  $8\frac{1}{2} \times 11$  paper on which you may put any hand-written notes that you wish. You will generally be given the values of important physical constants, if you need them. The hour exams will be given in lecture. The final exam will three hours long. All exams *together* will count for a total of 55% of your grade.

**Note Regarding Missing Exams:** Students are expected to make *every effort* to attend exams as scheduled. As a rule, there is no mechanism for rescheduling or arranging for a make-up exam for a missed exam. Students who incur a personal emergency (accident, illness, etc.) must contact the instructor directly *immediately* and – as a rule – this must be done prior to the exam time. Students who miss a regular hour exam during the semester, and who wish to avoid academic penalty must document the nature of the personal emergency with the instructor. Again, as a rule this must be done in advance of the exam.

**Note in particular for exam conflicts with athletic and/or intramural activities: These conflicts must be addressed and resolved at least two weeks prior to each exam.**

**Note: There is a special rule regarding absences for the Final Exam.** In accordance with university policy, only the Office of the Dean of Undergraduate Studies can authorize an excused absence from the Final Exam of any course. If you believe you might miss the final exam for any reason you need to contact the Dean's office directly – *not* the instructor. Note that the Dean will *not* authorize make-up final exams to accommodate early departures from campus for the summer holidays. **The final exam for Physics 122 is on May 5 from 4 to 7 PM. All students must take the exam at that time. Any student who does not take the final at the proper time will not pass the course.** Plan your travel accordingly!

### Laboratories:

For many of you the labs will be “something different”. We take our intro labs seriously at Case Western and the level and quality of the labs here is, in my opinion, far superior to what you will find at peer institutions. You will get much more out of the lab experience if you understand

the goals of the lab and invest yourself toward these goals. These goals are articulated in an article entitled “A Sermon on the Labs” that Dan Schultz and I wrote and that you will find in the first section of your lab manual.

**Important: Doing well in Physics 122 requires students to deal properly with labs.** Note that the laboratory counts for 20 percent of your total score. This will make a difference. The labs are administered and graded separately on a fixed percentage scale and the lab policies are such that any student who misses more than one lab and/or fails to submit more than one lab report is not likely to earn a passing grade in the lab. Students not taking the lab seriously are the *number one reason for withdrawals and failing grades in Physics 122*. Grading policies for the labs are determined and applied by the Laboratory Director: Dr. Diana Driscoll: [diana.driscoll@case.edu](mailto:diana.driscoll@case.edu). In the past, a minimum raw score of 60% or higher has been required to pass the intro labs.

**Important: Do not miss your lab assignment!** Each student is assigned to a lab that meets every other week. Students can easily get confused about this. I suggest that you sort out any confusion about when your assigned lab slot is right away and make sure you mark on your calendar the specific times and dates for your lab so that you do not miss them. The bottom line on the labs is that you must do a decent job on them or your grade will suffer substantially. **You must not miss your assigned lab.** Several people got into serious grade trouble last year by not taking the labs seriously. **Several students who were earning decent grades in the class earned a D or an F in Physics 122 because they did not deal properly with the labs!** If you fail to attend or complete even one or two lab reports you can quickly find yourself in serious danger of failing labs. It's worth repeating this because it is so critical: *The single most common reason that students in Physics 122 fail or are forced to withdraw from the class is because they do not properly attend lab and/or do not properly hand in their laboratory assignments.* You really don't want to have to explain to your parents that you had to withdraw from physics just because you forgot to mark your calendar to attend labs, do you?

Here are some of the key policy rules for the lab:

- Reports due: one week after you do the lab (For the spring break week, reports are due one week BEFORE you perform the next lab.)
- Written reports must be submitted hard copy *and* electronically to MyDropBox.com. Failure to submit the electronic copy will result in a zero for the lab. Labs must be submitted to MyDropBox.com within 24 hours of the hard copy submission.
- Deadline for requesting an end-of-semester makeup: 2 weeks from the date of the missed experiment
- Deadline for resolution of *all* problems: First Reading Day before Finals (**April 28, 2009**)
- You may lose points for each instance of: wrong mailbox, missing report cover sheet, incomplete ID, forgetting your notebook (5 pts)
- If you miss a lab without valid reason you earn a zero (0) for that lab.

- If you know you have a conflict with a lab for a athletic activity or other pre-scheduled event you must make arrangements with your TA and/or Dr. Driscoll to reschedule your lab at least **two weeks in advance**.
- Late arrival or attending wrong lab section without valid reason: 5 percent of the points from your total lab grade, for the entire semester per occurrence.
- Late work: 10 percent (of total credit) per weekday until 1 week after due date, 0 credit afterwards. Penalty applies to *all* parts of the lab, even if some parts were submitted on time.
- Correctly Attributed Copying: 50-100 percent of value of copied work (depending on amount copied) with minimum loss of 6 points.
- Plagiarism: 100 percent of your grade for the report and forwarding of evidence to the Office of the Dean.

## How to Contact the Instructor:



In the modern age of communications, there are several ways to reach me:

Corbin Covault

Office Phone: (216)-368-4006 (with voice mail)

Secretary: Lori Rotar Morton: (216)-368-4257

Mobile Phone: (216)-496-2077

Internet Email: [corbin.covault@cwru.edu](mailto:corbin.covault@cwru.edu) (**Please put “Phys 122” in subject!**)

Web Bulletin Board: <http://www.phys.cwru.edu/courses/p122/>

**Office Hours:**                      Rockefeller 207 **Mon, Thu, Fri TBD**  
see Phys 122 Web page  
Other times: by email appointment

The easiest and the best way to contact me is send me e-mail. *Please put the words “Phys 122” or P122” in your subject line as I am much more likely to notice this sooner.* I check my e-mail frequently and I save everything. If you call and ask me something on the phone or ask me for something right after class, I am more likely to forget. If it is important, send e-mail, and include a header like: “Phys 122: Important: Need help on Homework Problem 3” or whatever.

You should feel to try to reach me any time, day or night. From 7:00 AM to 9:30 PM please feel free to contact me at work or at home by phone, e-mail, etc. If you leave a message on my voice mail, please *speak loudly* and be sure to state clearly your *full name*, when you are calling (time and date) and how I can reach you. **After 9:30 PM, please send me e-mail or contact me using my mobile phone.** Try e-mail first. If you are up late working, chances are high that I am up too. **Please do not call me on my home (land-line) phone late at night as this will disturb my wife and young children.** Instead, if you want to talk to me, ring my mobile phone. If I am awake, my cell phone – which I keep with me always – will give a soft chirp and I will respond by calling you back immediately and/or by email. If I am asleep, then you can leave a message and I will try to contact you later when I wake up. Again, also always try to leave an e-mail message at [corbin.covault@cwru.edu](mailto:corbin.covault@cwru.edu) with the words “Phys 122” in the subject, to tell me how and when I can reach you.

This document has just told you everything you need to know to track me down. Please do so as soon as it is clear to you that you need to communicate with me about anything regarding this course, particularly if you have a concern or problem. If you leave a message or page me on the phone I will try to get back to you as soon as I can.

Note also that I get immediate email notification whenever someone leaves a message on the P122 website bulletin board. So if you have a question that you think might be of general interest post it there and I will reply so that everyone can benefit. I check the bulletin board on the web page most every day.

### **Instructor's Office Hours:**

I love to meet directly with students. My main office hours will be **Thursdays, Fridays and Mondays in my office, Rockefeller 207**. The times will be set during the first week and will be posted on the Phys 122 web page. If the posted times slots are bad for you, contact me directly to schedule an appointment at a more convenient time. I encourage you to approach me immediately after the lecture if you would like to clarify some point or discuss anything in the course material that is not clear to you.

I want to be as accessible as possible during the semester. I am willing to meet with students on most any day if you make an appointment. I welcome students visits. Please come see me often. Call ahead if you are able, since I sometimes have lab meetings and so forth that take me out of the office. Sometimes there is a sign on my door if I am out indicating where I am and when I will return. But in any case I am always happy to schedule an appointment. **Note: I am generally not on campus on Saturdays, Sundays, and Wednesday afternoons, although I should be reachable by phone or email on any of these times.**

### **Even More Help for P122: SI Sessions:**

Another extremely valuable resource for students are the university Supplementary Instruction Leaders (so-called 'SI Leaders') which are top-ranked upper-class students who have been hand-picked by the office of Educational Services for Students to act as "peer tutors" for major classes. We will have two SI's for Physics 122, and these are often the very first and very best people to turn for when you need extra help with homework or in preparing for exams. The SI's sit in the lectures but otherwise run their own tutorial program independently of the department (a good thing!). Schedules for SI review sessions and/or homework help sessions will be announced in lecture and (ideally) posted on the web page.

### **The P122 Web Page:**

We are supporting the administration of this class on the web. The URL address of the Physics 122 Home Page is: <http://www.phys.cwru.edu/courses/p122>

The P122 Home page will support the following:

- A copy of every document generated for the class including syllabus, homework assignments, exams, announcements, etc.,
- Scanned homework solutions and exam solutions, and (on occasion) lecture notes,
- Special practice problems with solutions,
- On occasion, audio recordings of lectures,
- Links to Mediavision video archives of all lectures.
- Links to registration and support information for the PRS wireless Classroom Response System.
- A bulletin board for public/anonymous Q&A between students and instructor (very handy!), and

- Pointers to other resources that might be useful for P122.
- An (occasionally) updated anonymously indexed report of student point scores in the course.

There is also a web page which has all of the details on the physics labs: <http://physicslabs.phys.cw>  
Please check this out for any details concerning the lab.

Your feedback is welcome.

## Grading policies:

I strive for a fair and impartial grading policy. Your grade should reflect the degree to which you have demonstrated mastery of the material and central concepts of the course. The grading will be based *strictly* on a comparative total numerical score tallied at the end of the semester. Your scholarly attitude, diligence, and effort will only impact your grade insofar as they increase your ability to earn higher numerical scores on the assignments. Your numerical score alone will determine your assigned grade. This means that everyone with the same total numerical score will get the same letter grade. There is no mechanism for “extra credit”.

The numerical grading system assigns a total of 1000 points, as follows:

<b>Work:</b>	<b>Points:</b>	<b>Percentage:</b>
First hour exam	50	5%
Second hour exam	100	10%
Third hour exam	100	10%
Final exam	350	35%
Homeworks (20 pts each)	200	20%
Laboratories	200	20%
<b>Total:</b>	<b>1000</b>	<b>100%</b>

In addition to the numerical score there is a further constraint: **Any student who is not present for and/or does not take the final exam will not earn a passing grade in P122.** Note that only the Dean of Undergraduate Studies has the authorization to excuse an absence from any regularly scheduled final exam.

Note that I do *not* assign letter grades to individual assignments or exams. Letter grades are assigned only in two instances: (1) provisionally at mid-terms and (2) at the very end of the course.

Letter grade assignments will correspond to numerical score ranges. The correspondence between numerical scores and letter grades will depend both upon the distribution of the scores and upon a reasonable expectation for performance in the course. Students who can demonstrate minimal understanding of the key concept of the course will receive a passing grade. Students who display deeper understanding will receive higher grades.

All of the time I have students ask me about my grading policy. The question usually boils down to *Do you grade on a curve or do you grade straight percentages?* The answer is *neither*, exactly. So here, in detail, is how I grade:

For any particular assignment or exam, I have an *apriori expectation* for how well students ought perform and I check my expectation by calibrating it against the actual performance of the students in the class. As a rule, the calibration corresponds to a typical student who is near the middle of the class earning a letter grade of “B”. My expectation value will vary from assignment to assignment but I will generally target a median performance level of approximately 60 to 70 percent of the points on exams. But this will vary from exam to exam and it cannot be predicted or forecast by students or the instructor in advance. This means that if everything goes according to my *apriori expectation*, students who earn scores of very roughly 65 percent on exams and who

keep up to class average on homeworks and labs can expect to earn a “B”. Students who perform at levels substantially higher or lower can expect to earn correspondingly better or worse letter grades. If student performance has a distribution that matches my expectations, then roughly half of the students will earn B’s, one quarter will earn A’s and the remaining 1/4 will earn something else. In the past, the “A/B” cutoff percentage has been somewhere in the low to mid-80’s. The C/B cutoff has been somewhere in the low to mid 50’s, and student will almost certainly need to earn at least 40 percent of the points to pass. All of these numbers correspond to a very approximate “apriori expectation baseline” and are subject to change, but these are roughly my expectations.

However, sometimes student scores do not match my expectations. In this case I *adjust* the grading system – but I only do this if this works to the advantage of students. Here’s how this works in two possible cases.

First, if for the class *as a whole*, student performance is generally *better* than my expectations, then on average letter grades will be generally *higher* and *all* students who perform better than my expectations can expect at least a “B” and possibly a “A”. In this case no “adjustment” is made. In other words, if exam averages are significantly higher than the expected value of 60 to 70 percent, the average grade can in fact be significantly higher than a “B”. In principle this means that, every student in the course can earn an “A” by performing at a level that is significantly higher than my *apriori* expectations for a “B” performance level. Note: This means that you *cannot* raise your grade in the course by working actively to lower anyone else’s grade. Your grade will depend upon your performance alone.

However, if for the class *as a whole* student performance is generally *worse* than my expectations, I usually attribute this to problems with the course (ineffective lectures, over-difficult or over-long exams, etc.) In this case I *adjust* (i.e. curve) the course grade so that the student who performs at an average level can still expect a grade of “B”. In other words, if the class average on exams drops much below the apriori expected scores of 60 to 70 percent, then I curve the grades so that the average student can still expect a “B”.

Basically, then, I curve the class if it helps the students. Note that the decision to adjust is made on an exam-by-exam basis and

Finally, since I do not grade on an fixed pre-set “absolute” scale, I cannot precisely predict in advance what final point total or what percentage points on any given assignment will correspond to what particular letter grade. If you ask me for this, I will tell you that I cannot do it. I know that for some students it is very important to know exactly what their letter grade standing is. Unfortunately, I can only determine this approximately until we reach the end of the semester. And in general this means that students who want to get an idea of where they stand will usually need to make an arrangement to meet with me to discuss this in office hours. However, I am very happy to meet with individual students who are interested in learning “where they stand” at any point in the course based on work completed. Please see me directly if you have any concerns or confusion as to how the grades for the course will be determined.

One final point: In evaluating the work we will strive to achieve the most fair and objective grading strategies. This means, for example, that all of each exam problem will be graded by a single grader, for consistency, etc. Exams will cover materials discussed within lecture or material

in the texts referred to within lectures only. You will not be responsible for material outside the scope of the course as delineated in this syllabus.

### Optional Bonus Insurance Points:

Note that there is, in general, no mechanism for “extra credit” in Physics 122. Grades are based strictly on numerical point totals only. However, there will be several occasions during the semester for students to earn “Optional Bonus Insurance Points”. Students can earn OBIP’s by participating in optional course activities, including participating during lectures with the PRS wireless classroom response system and completing online class surveys. Here is a table that describes tentative OBIP point assignments for various activities:

Activity	Bonus Points
In-class “clicker” participation	1 or 2 points per lecture
Online Optional Reading Quizzes	1 or 2 points per quiz
Completing Online Surveys	1 to 2 points per survey
Other activities TBD	1 or 2 points per activity

As a rule, regardless of the student participation, a maximum of 4 OBIP’s can be earned in any particular class week, and a maximum of 40 OBIP’s can be earned for the entire semester.

OBIP’s will be applied to raise the score of any *one* problem on the final exam. The final exam will have nine questions. Question will be worth between 30 and 50 points. Student OPIB’s will be automatically applied to one question only so as to maximize the total score for each student. Note that no matter how many OBIP’s a student has, they can only be applied to one problem on the final exam. OBIP’s cannot be used to adjust homework or lab scores.

Notice: All course grades will be initially determined prior to the application of OBIP’s. OBIP’s will be applied after an initial grade determination, and then grades will be adjusted to determine the final grade. This means that OBIP’s cannot directly or indirectly lower the grades of any student and OBIP’s may raise the grades of some students. All OBIP assignments are completely optional. Failure to complete any OBIP assignment cannot hurt any students grade.

Important: OBIP’s are experimental and are not guaranteed. They may not be traded or negotiated for in any way. **The entire OPIB program for Physics 122 may be completely canceled or withdrawn for any reason by the instructor for any and/or all students at any time during the semester before grades are assigned.** All decisions regarding the application of OBIP’s are at the discretion of the instructor and all decisions regarding OBIPs are final.