INTRODUCTION TO PHYSICS 108
INTRODUCTORY APPLIED PHYSICS LAB:
ELECTRICITY AND MAGNETISM,
OPTICS, AND MODERN PHYSICS

August 22, 2011

Read this!

The first thing you need to know is . . . everything in this introduction. If you don’t know what’s in this document, you will not be prepared for class. If you are not prepared for your first lab, you will not be happy with the results! So make sure you read this introduction and do what it says prior to the first lab!

What is the point of Physics 108?

That depends - you’re not all here for the same reason. Physics 108 is designed to support Physics 106. It is not likely that many of you have much experience with things like electrons, field lines, focal points, or particle emission, which makes Physics 106 rather challenging. This lab will help you develop more intuition for these topics.

Why do you have to take Physics 108? The answer may not be obvious to you. Many of you are in a pre-medical or pre-dental program. Medical schools are particular about required courses, and they wouldn’t make you take physics labs if they weren’t important. This is an opportunity to ponder what this class has to do with your major or career. If you don’t find a good answer in a few weeks, please come by my office and we’ll chat about it.

In addition to helping you achieve career goals, I also hope that this class will increase your wonder of creation. We live in a universe that is both incredibly complex and amazingly simple. It is enormously vast and diverse, but full of symmetry. I hope that you will better appreciate the beauty of physical law after taking this class. Your mechanical abilities and
logical reasoning skills should expand while performing and analyzing these experiments. And I hope that you enjoy yourself. I think the experiments you will do are really neat, and I think you will too.

This class is set up such that pretty much everyone who comes prepared and on time to every lab, works hard, thinks clearly and participates will get a good grade. So be responsible, but try to relax and have fun too. Besides, no matter how much you may hate physics, you have to admit that it’s better than organic chemistry :) 

![Physicist comic](https://www.strangequark.com/comic/streak.png)

Physics 108 web page

A link to the course web page can be found by going to [http://www.phys.bvn.edu](http://www.phys.bvn.edu), clicking on “Courses” and then on “Class Web Pages.” If you did not get a course ID number emailed to you for this class, if you changed sections after receiving your course ID, if you don’t remember your course ID number, or are just unsure which ID number to use for this class, you should go to the course web page and follow the link there to get an ID number (if one has already been assigned to you, it will not give you a new one, but will tell you what number was already assigned). Your scores can also be viewed using a link on the course web page. Please check frequently to make sure your scores are recorded correctly.

Adding and dropping

Adding and dropping (including sections changes) are done by computer through the entire add and drop period. Please be aware of the fees associated with such changes. Also, please make any changes that you need as early as possible so that other students can get into the class.

Preparing for the lab

**Read each lab before coming to class.** Review the physics involved and get a general idea of what you will do. In the manual you will find an answer sheet for each lab. On that sheet there is a space to write an overview paragraph about the lab. **The overview is to be written before you come to the lab. Your lab instructor will verify your completion of this overview before you begin the lab.** Because you can’t see the equipment before coming to lab you may not understand details of how some equipment works. The purpose of the overview is to ensure that you are properly prepared to make optimal use of your time in the laboratory – performing the experiment. In the overview
paragraph we are looking for a good conceptual understanding of what physical principles
the lab is supposed to illustrate and how the activities in the lab do that. We are not looking
for a restatement of what is going to be done.

At the beginning of each lab

Your instructor will show you the equipment and explain how it works. He or she will not
discuss the physical principles or laws much; you will already have reviewed them before
coming to the lab. You should be organized into groups of at most four lab partners. You
will work together in taking data and discussing it, but you will each write your own results
and analysis. Make sure the instructor sees and initials your overview paragraph at the
beginning of the class period.

Use of lab time

We don’t want you to feel hurried in the lab. It’s hard to think creatively or carefully, or
to enjoy learning if you’re feeling pressured for time. In addition, experiments seldom go as
planned; technical difficulties arise. Don’t be frustrated by them, but try to learn from them.

Attention will be paid to the quality of the work you do perform, and how earnest your
effort is. If you do not complete your lab, but you have been making an honest effort (your
TA will know!) it will not affect your grade on the Measurements and Analysis portion (part
C, see page iii). If you do not complete the lab and you have been goofing off, it will affect
your grade. If you are not able to complete the lab you should indicate the reason in your
discussion section and have your TA initial it. There is always plenty to do in the lab,
so we expect you to arrive on time and to use your time well. You will be graded on how
well you think about and describe what you see and learn. If you come late, leave early, or
simply waste time, it will hurt your grade.

This is a one credit-hour class. A one credit-hour class at BYU is interpreted as 3 to 4
hours of work per week.

Getting help in the lab

Your instructor will help you to understand and use the equipment. Your instructor will
help you solve problems you have in taking data, graphing it on the computer, and curve
fitting. Ask for help if you have difficulty doing the experiment.

However, when you don’t understand your results and the physics (and that may be
most of the time), talk to your lab partners. Take your time to talk it over and try to
figure it out. You might consult your text. If your lab group can’t make sense of it, ask other class members. We’ve asked your instructor not to answer your questions about the physics too quickly during the lab.

Lab reports

Lab reports are due at the end of the lab period and you are to give them to your instructor before leaving. You will have time in class to complete the answer sheet associated with each lab. You can often write most of the report as you do the experiments. We have found that students over-invest their time in the class if the reports go home with them (again, this is a one credit-hour course). Instead we wish you to write while the experience is fresh.

The reports are informal and hand written. If you concentrate on the quality of what you write, you shouldn’t have to write too much. Remember the purpose of everything you write is to communicate either what you know or what you have learned. Keep your reports concise and focused. Avoid redundancy; we are fully aware of the procedure so do not repeat to us the steps of the experiment – this will reduce your grade. Write your measurements, observations, results, and discussion in your own words. Be sure to include the units on any numbers that have units. Include tables, graphs, and computer printouts, but be very careful that you label, identify, and explain what you see in them. Be sure to include on graphs what each axis represents and their units, as well as what the graph is telling you. Communicate clearly your interpretation of the graph. Make sure that you include all graphs with your lab report. If you do not include them when you turn in your report they WILL NOT be considered later.

Make sure you write your name, date, the lab, and your section number on the report.

Making up missed labs

This is a lab course - learning is done primarily in the lab. Attendance at every lab is vital to getting a good grade in this class.

If you miss one lab, and don’t make it up, your grade will drop by one level (e.g. from A- to B+) from what your grade would otherwise be based on the labs you completed. If you miss a total of two, three, or four labs, your grade will drop by a total of three, five, or seven grade levels, respectively. If you miss more than that, you will not pass the course.

You may attend labs in other sections only with permission and for valid, infrequent reasons such as being out of town for a BYU performance or Medical/Dental school interview, family emergencies, or illness (with a note from your doctor). It is never acceptable to go to another section so you can study, do homework, or take a test (even for
physics). Plan ahead. If you attend another section without prior arrangements you score on that lab will be reduced by 25%.

If you must miss a lab, you can attend another section doing the same lab (once the equipment is taken down it’s too late). To do this you must have an appropriate excuse and permission from the course supervisor. Due to lab capacity limits and other factors, you can not be guaranteed a “convenient” section. See the course web site or the course calendar for information on contacting the course supervisor.

If you attend a different section to complete a lab, turn in your report to the TA in the section in which you are doing the makeup. It will be returned to your normal section after grading.

We will have makeup labs twice during the semester (see the schedule for when those will occur). We will have sign-ups for these makeup labs a couple of lab sessions in advance so that we can have the appropriate equipment ready. These make up periods are really intended for emergency use only. You are not allowed to attend a makeup for a lab you have already completed. You will only be allowed to make up one lab in each session unless you have explicit permission from the supervising professor (not your TA). You are also only allowed to make up the labs specified for that session unless you have explicit permission (rarely given) from the supervising professor (not your TA).

Grading of labs

Your TA will visit you and initial your overview paragraph (near the bottom of what you have written) at the beginning of the lab. Your TA will also grade your participation during the lab period. Separate graders will grade other parts after the period. Graders will rotate, so that grading will be uniform across different sections. This is important to note - just because a grader let you get away with something on one lab does not mean you will be able to get away with it on another lab. Be sure to always do your best work.

Your grade on the lab will consist of the following 4 parts:

A. Preparation: 3 Points.
How well was the overview section is written? Did you cover the main concepts of the lab, and how the lab will illustrate those concepts? Your overview paragraph has to convince the grader that you have read and understood the manual before coming to lab.

B. Participation: 3 Points.
Were you on time? Did you follow grouping instructions? Were you active in discussion? Were your hands on the equipment? Did you treat equipment with care? Were you engaged with experiment? Did you clean up work area before leaving.

C. Measurements and analysis: 3 Points.
Did you take careful data and record it properly? Were your analysis and calculations correct? Did you include units? Did you attach printed graphs attached when appropriate, and were graphs and tables correctly labeled?

D. Results/Discussion/Conclusions: 3 Points.
Did you include insightful comments on results and discussion of how well the measurements show physical principles? Were possible sources of error in your results identified? Did you find relationship between what was done in the lab and other physical systems outside the lab? Did you explain what you learned in the lab? This is not intended to just be a review of the lab. Your goal should be to convince the grader that you have thought about the concepts and results from the lab. If you ran out of time and did not complete the lab you should indicate the reason that you were unable to complete everything.

A score of 3 means that you have done everything expected of that lab, with maybe some minor problems. A score of 2 means that you were deficient in some meaningful way
(one missing unit is considered meaningful). A score of 1 means that the section is seriously incomplete or just wrong (more than 4 missing units is considered seriously incomplete). A score of 0 means that the section was not seriously attempted.

Papers during the semester

You will turn in two papers during the course of the semester. Each paper should be 2 pages, double-spaced with no larger than a 12-point font. The first will be due in class the week of lab 6. The last paper will be due at the time of the last lab period (lab 11). The topic of each paper should be an application to a real physical system of the principles of physics demonstrated in one of the labs completed during the preceding weeks, including the week when it is due. It is not acceptable to just rewrite one of your lab reports - your paper must be an extension of the concepts in that lab to a real application. In general you should limit your paper to the principles from only one lab. The first paper would be on one of the topics in labs 1-6; the second would be on one of the labs 7-11.

The papers will be expected to be well written, properly spelled, grammatically correct, and coherent in their ideas. Your TA will grade them as either acceptable or unacceptable. If a paper is unacceptable (because of the writing or wrong physics) you can rework it and turn both the original paper (complete with TA comments and grade) and the rewritten paper to the supervising professor and he will grade it. You have one week from when it was returned to you for this to be accepted.

The highest grade you can earn by just doing labs is an A-. You will need to do both papers to bring your grade to an A. If you don't earn an A- in the class (due to missed labs or poor labs) then the two papers will boost your grade by 1 grade level. If you only do one paper it will boost your grade by 1/2 grade level (i.e., if you have a low B+ it will stay B+ but if you have a high B+ it will be raised to an A-).

Your final grade

If you turn in all the labs and get 3’s on all sections you will get an A-. If, in addition, you turn in both papers you will get an A. If you miss more than 3 points, your grade will go down by one step (A to A-, A- to B+, etc). Each three additional points will lower your grade an additional step. For example, if both of your papers were acceptable and you received 2’s on four lab sections, you would receive an A-. Since a score of 2 represents a meaningful deficiency, four or more 2’s represents a meaningful deficiency in 36% or more of the labs that you did or multiple deficiencies in several labs. Your final grade is not based on any of the commonly used percentage scales.
Evaluation of the class

We support the idea of regular evaluation of instruction at the university. We encourage you to fill out the class evaluation on Route-Y during the evaluation period at the end of the semester. Since this is a laboratory class that is actually taught by a TA, and the university rating system does not allow us to associate the rating with particular TAs, we ask you to use the BYU course evaluation to rate your impression of the faculty instructor’s efforts to organize and administer this course. Near the end of the course I will post a link on the class web page to an independent survey which will allow you to give feedback about your particular TA. You are also welcome to email your instructor at any time with any thoughts, ideas, or concerns about the class or your TA. And if your TA does a great job, you are encouraged to tell them so!

Academic Honesty

The first injunction of the BYU Honor Code is the call to be honest. Students come to the university not only to improve their minds, gain knowledge, and develop skills that will assist them in their life’s work, but also to build character. President David O. McKay taught that “character is the highest aim of education” (The Aims of a BYU Education, p. 6). It is the purpose of the BYU Academic Honesty Policy to assist in fulfilling that aim. BYU students should seek to be totally honest in their dealings with others. They should complete their own work and be evaluated based upon that work. They should avoid academic dishonesty and misconduct in all its forms, including but not limited to plagiarism, fabrication or falsification, cheating, and other academic misconduct.

Honor Code Standards

In keeping with the principles of the BYU Honor Code, students are expected to be honest in their academic work. Academic honesty means, most fundamentally, that any work you present as your own must in fact be your own work and not that of another. Violations of this principle may result in a failing grade in the course and additional disciplinary action by the university.

Students are also expected to adhere to the Dress and Grooming Standards. Adherence demonstrates respect for yourself and others and ensures an effective learning and working environment. It is the university’s expectation, and my own expectation in class, that each student will abide by all Honor Code standards. Please call the Honor Code Office at 422-2847 if you have any questions about those standards.

Preventing Sexual Discrimination or Harassment

Title IX of the Education Amendments of 1972 prohibits sex discrimination against any participant in an educational program or activity that receives federal funds. The act is intended to eliminate sex discrimination in education. Title IX covers discrimination in programs, admissions, and student-to-student sexual harassment. BYU’s policy against sexual harassment extends not only to employees of the university but to students as well. If you encounter sexual harassment or gender-based discrimination, please talk to your professor; contact the Equal Opportunity Office at 422-5895 or 367-5689 (24-hours); or contact the Honor Code Office at 422-2847.
Students with Disabilities

BYU is committed to providing a working and learning atmosphere that reasonably accommodates qualified persons with disabilities. If you have any disability that may impair your ability to complete this course successfully, please contact the Services for Students with Disabilities Office (422-2767). Reasonable academic accommodations are reviewed for all students who have qualified, documented disabilities. Services are coordinated with the student and instructor by the SSD Office. If you need assistance or if you feel you have been unlawfully discriminated against on the basis of disability, you may seek resolution through established grievance policy and procedures by contacting the Equal Employment Office at 422-5895, D285 ASB.

Children in the Classroom

The serious study of the physical and mathematical sciences requires uninterrupted concentration and focus in the classroom. Having small children in class if often a distraction that degrades the educational experience for the entire class. In addition, the presence of young children in a lab course could result in injury or damage to equipment. Please make other arrangements for child care rather than bringing children to class with you. If there are extenuating circumstances, please talk with your instructor in advance.

A Final Note

Like any class, what you get out depends on what you put in.

Have a good attitude, be responsible, and go forth to succeed! This class is not graded on a curve (I believe that they are evil). Helping each other will not hurt your grade, but will probably help it. If everyone earns an A, everyone will receive one! So be responsible, be prepared, and stay focused so you can get yours. There is no try!