# *Course Syllabus*

PHYS 2126 (all sections); PHYSICS LABORATORY II fall 2013

**Professor Contact Information**


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Each section meets in SLC 1.211 as indicated.

| Section | Day | Begin |
|---|---|---|
| 101 | M | 1:00 |
| 102 | M | 4:00 |
| 601 | M | 7:00 |
| 103 | T | 10:00 |
| 104 | T | 1:00 |
| 105 | T | 4:00 |
| 602 | T | 7:00 |
| 106 | W | 10:00 |
| 107 | W | 1:00 |
| 603 | W | 7:00 |
| 108 | R | 10:00 |
| 109 | R | 1:00 |
| 110 | R | 4:00 |
| 604 | R | 7:00 |
| 111 | F | 10:00 |
| 112 | F | 1:00 |
| 113 | S | 10:00 |

**Course Pre-requisites, Co-requisites, and/or Other Restrictions**
Any student enrolling in this lab class should either have done or be doing PHYS 2326 (Electromagnetism & Waves), 1302 (College Physics II) or equivalent.

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**Office hours**: TAs will be assigned to this course and their office hours have yet to be arranged. Office hours will be posted on the eLearning site for the course. Otherwise, office hours are by appointment at my office.

**Course Description**

The course includes experiments designed to explore Electricity and Magnetism. As always in Physics, there is interplay between the theory that you see in a class and experimental work. One is not more important than the other but each informs the other: theoretical predictions are a natural focus of experiment and experimental results help to develop theory. That is why you need to study both.

The labs called Electricity I, Electricity II etc develop the ideas behind DC circuits. The others concern Oscilloscopes, RC circuits and Helmholtz coils.

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**Student Learning Objectives/Outcomes**

The aims of the course are to perform experiments in which:

- Students will use simple observations to deduce properties of DC circuits.
- Students will compute time constants given changing voltages in circuits that involve resistors and capacitors
- Students will make an almost-uniform magnetic field using Helmholtz coils

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**Required Textbooks and Materials**

We use a manual that I have written and that is copied by the copy center for students. **You need a lab manual at every lab meeting of your section** and can get one at the campus bookstore. (If I post the manual or parts of it on eLearning then you are free to print it yourself if you prefer that to buying a copy.)

**Suggested Course Materials**

You should have a calculator, pencil and pen at all meetings of your section. (The calculator need only be a 'scientific' one.)

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**Assignments & Academic Calendar**

**Expect to see some topics for the first time in this lab course.** Lab time is limited so I require all students to read the introduction to each experiment in the week before the experiment. If there is a Pre-Lab in the manual that is associated with any experiment then it must be done before the experiment itself. No prior familiarity with physics labs is assumed. Ask questions during office hours before your lab meeting if needed.

The lab reports consist of answers written to questions posed in the lab manual. You can write these answers on any paper that you have at the lab (or on the sheets of questions and answers that I post on eLearning provided that you print them before the lab begins.)

## Schedule

| Meeting | Experiment |
|---|---|
| Aug 26 – Sept 31 | Course information & Pretest |
| Sept 2 – Sept 7 | *Week of Labor Day – no lab scheduled* |
| Sept 9 – Sept 14 | Electrostatics I; Report |
| Sept 16 – Sept 21 | Electrostatics II; preLab & Report |
| Sept 23 – Sept 28 | Electricity I; Report |
| Sept 30 – Oct 5 | Electricity II; preLab & Report |
| Oct 7 – Oct 12 | Electricity III; preLab & Report |
| Oct 14 – Oct 19 | Electricity IV; preLab & Report<br>[The exercise on 'Drawing Graphs with Excel' is *due* ***this week***.] |
| Oct 21 – Oct 26 | Electricity V; preLab & Report |
| Oct 28 – Nov 2 | Ohm's law; preLab & Report |
| Nov 4 – Nov 9 | Multimeters; preLab & Report |
| Nov 11 – Nov 16 | Voltage across a big capacitor; preLab & Report |
| Nov 18 – Nov 23 | Introduction to Oscilloscopes; preLab & Report |
| Nov 25 – Nov 30 | *Week of fall break & Thanksgiving Day - no lab* |
| Dec 2 – Dec 7 | Helmholtz Coils; preLab & Report<br>(Posttest) |
| Dec 9 - 11 | *No lab scheduled* |

**Grading Policy**

As in the printed lab manual

**Course & Instructor Policies**

The course policies for this semester will be in the printed lab manual. Please read them before the first meeting of your lab section. The following is from the preface in the manual. It is intended to help you by giving you an idea about my expectations, things I emphasize etc.

The most important goals of these labs are to;

- Learn to build scientific models
- Let you think critically & practice your reasoning skills

*What are scientific models?*
Models are arrangements of fundamental ideas that explain physical phenomena. The fundamental ideas in the model must be suggested by physical observation. The model must have some predictive power.

I want you to do more than use a model that someone else made. I want you have a hand in coming up with a model. You will do this by making observations and thinking about their significance in relation to other observations that you have made.

An example of a model that you have encountered in physics I is Newtonian mechanics. It probably wasn't presented as a model in your class but is a model nonetheless. It contains three laws that are suggested by observations. (Newton's three laws are the 'fundamental[1] ideas' that are part of any scientific model.) It is an extremely successful model in that Newton's model explains the motion of objects in many circumstances.

Models are built by asking ourselves questions & suggesting tentative answers (often called hypotheses). The hypothesis is scientific if it is subject to comparison with physical reality. (While it may be interesting, any non-testable hypothesis is outside the realm of natural science.) There must at least be approximate agreement between physical reality and predictions made using the hypothesis if we are to accept it as not being false.

*Why/How do we practice reasoning and critical thinking skills?*
Even if you don't usually think about scientific models, you will still need to think critically about the information that you encounter. You practice critical thinking when you put things together for yourself rather than just going along with conclusions made by other people. (Even though you set out to reach your own conclusions, you might end up agreeing with the conclusions of other people.)

Critical thinking is easier if you ***make observations yourself*** because you'll know exactly what happened etc. (I try to avoid indirect 'observation' where you have to take my word for it that a certain result/observation is what happens. In this manual, 'observation' always means 'direct observation'.) ***I hope that you don't think that I am***

[1] Remember that 'fundamental' doesn't mean 'easy'!

***underestimating your abilities when observations are simple***. I'm not. I just want you to be thorough and to be sure of the fundamental observations before your use them to make conclusions.

## Implications:

The goals chosen have certain implications.

- *Lab Apparatus must be simple*. This reduces the time needed to figure how any particular measuring device works. Needlessly complicated equipment just puts you in the position of taking the word of someone else that the equipment operates as you are told. Needless complexity makes it very hard to think critically

- *Lab reports have a simple structure*: *in this lab, reports involve writing answers to questions*. Questions on lab reports often involve 'pulling together' several observations so that a useful idea is seen more clearly. The simple structure is intended *to give you time to think critically* and think about the significance of your observations

- We'll concentrate on *systems* (electrostatics & DC circuits) *in which a small number of fundamental ideas is enough to make a model* that can explain your observations. These systems also have the advantage that it is possible for us to make all the necessary observations with the simple apparatus that we'll use

- *'Covering' new material is not a very important goal in these labs*. Actually, the involvement of lots of unfamiliar material makes it difficult to think critically and to build models

If we restrict ourselves to observations that we make ourselves then **some familiar terminology will be out of our reach**. Good examples are the terms; **'electrons', 'protons' and 'neutrons**'. Observations come before any terminology that explains the observations. Since we won't be directly observing these fundamental particles in this lab, you won't need to use these terms. ***Put these terms aside when you need to explain an observation in this course***. From another perspective, not using these terms won't hinder your explanation of anything that you'll see in these labs. (Of course, all your conclusions will be consistent with electrons, protons and neutrons when you want to explain 'microscopic' observations later.)

Another difficulty with terminology occurs when we observe electric circuits. All of us have heard of voltage, current and resistance though the meaning of these terms may not be totally clear. The root of this difficulty is probably that you haven't observed circuits directly yourself. Part of the solution involves not using ***the terms voltage, current and resistance to explain anything in these labs***. This won't be enough. You'll be refining ideas that underlie these terms as you develop a model of electricity. Unfortunately, half-understood ideas about voltage, current and resistance delay your understanding. Using them puts you in the awkward position of not knowing if what you suspect is actually true or if the problem is with partly understood terminology. It is very easy to confuse a fundamental idea with a piece of technical terminology that is often used to describe the fundamental idea. ***A practical solution is to leave those terms aside and develop a set of 'home-made' terms ourselves***. (I'll help through suggestions and instructions in the manual.) After we are sure of our understanding, it will be easy to exchange our terms for the more usual ones. Why bother doing this? Since you'll have been involved in defining our 'home-made' terms from the beginning, you'll know exactly what they mean. We'll use these 'home-made' terms until we do the lab on 'multimeters'.

## Practicalities

***You will do a quiz about DC circuits at your first lab meeting***. This quiz contributes to your course grade. (See course policy #2 for details.) The quiz gives you the opportunity to tell us about your initial understanding of DC circuits and will involve the usual terms of voltage, current & resistance. The test is about batteries and the brightness of one bulb in a circuit compared with the brightness of other bulbs.

A feature this ***multiple-choice quiz*** is an ***option that allows you not to choose an answer*** but shows that you thought about the question and took the quiz seriously. The idea is not to force you to choose when you haven't seen the topic of the question or are genuinely unsure of the answer. Of course you can use anything that you know and any convictions about how circuits actually work. ***If you can't reason your way to an answer after considering the question for a minute or so, then choose option (k) instead of making a random guess*** at the answer. ***Don't spend time trying to eliminate answers that you think 'must be wrong' and guessing*** among the ones you find most plausible.

Even though these topics have technically been 'covered' in your previous courses, the reality is that the average student doesn't do particularly well with this pretest. I choose to take this result

seriously and use a large fraction of the course to give you the opportunity to do something about this. Please take the opportunity.

In the past, I have found it to be useful to return right to the beginning of DC circuits and to take as little as possible for granted. Rather than tell you (again) how DC circuits work, I invite you to put things together for yourself. ***Please have patience with yourself: it is not easy to put ideas together if you haven't had to do this much before.*** (This is just as true if the subject matter is dismissed as being 'simple'). I hope that learning the skill in this context will help you to put ideas together in other contexts later.

Make good use of ***office hours***. A quick ***question asked early*** is often all that is needed to make progress on a Pre-lab. By all means, tell me or your TA if you don't understand something. However, ***complete answers to questions are not helpful unless you have grappled with the questions yourself***. Expect any of us to ask you what you think (and why) before saying much more.

Expect something similar during the labs: ***expect TAs to ask you questions about what you are thinking or doing***. Their questions are intended to *encourage you to think about things* in useful ways while leaving the implications and conclusion to you! During the lab, the TA may also ask any person to explain something or repeat any part of the procedure if they feel it might be helpful.

***My TAs do almost all of the face-to-face instruction in these labs.*** Several of the lab sections will meet during my other classes and office hours for those other classes. Lab sections also meet during my other activities for the department; faculty meetings etc. I may pop-in for a few minutes when I can but that is all I expect to have time to do.

***Beware of blindly following instructions in the manual***. ***You are not being asked to follow a recipe so don't expect my instructions to be a detailed list of directions. Expect to have to read ahead and think about my instructions before doing anything.***

***If a question asks you to explain something then an answer of "yes/no" or "I can't explain" is not sufficient.*** Don't move on until you find explanations for things. Please write neat answers for your TA. This should be easy for questions that involve simple observations or data items. ***For more complicated questions, consider writing your first answer on another piece of paper. Only write your answer on the Report that you'll give the TA after you have thought about your 'draft' answer and are sure that it answers the question that was asked***.

*Does this approach work?*
***Yes.*** You will do another quiz towards the end of the course. (As with the first one, this quiz also contributes to your course grade. See course policy #2 for details.) Comparison of the two results has indicated significant improvement in every semester.

## Student Conduct & Discipline

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

## Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

## Email Use

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

## Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

## Student Grievance Procedures

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the deal will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

## Incomplete Grade Policy

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of **F**.

## Disability Services

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:
The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove classroom prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Classes enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

## Religious Holy Days

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

***These descriptions and timelines are subject to change at the discretion of the Professor.***