COURSE SYLLABUS *Fall 2018*

PHYSICS 251L: PHYSICS II LABORATORY

Description:
Laboratory to accompany PHYS 251. Corequisite: PHYS 251.

Instructor: Dr. Ted Clarke

Text: Lab procedures are available on Dr. Clarke's webpage.

Goals:
This laboratory course supplements the lecture course, so it is designed to assist you in reaching the goals of Physics 251. The additional goals of this course are:
1. To investigate in more detail the topics discussed in Physics 251 lecture by direct, hands-on observation.
2. To test the models developed in Physics 251 in the real-world environment of the laboratory. To see how well the models work and to find their limitations.
3. To increase the qualitative understanding of physical phenomena by directly seeing how physical quantities affect each other, particularly how electric and magnetic fields affect charged particles.
4. To see how the process of measurement affects experimental results through measurement uncertainty.

Topic Prerequisites:
- basic algebra, trigonometry, calculus (differentiation & integration)
- Newton's Laws of Motion and Law of Gravity
- Law of Conservation of Energy

Outline:
There are eleven experiments to perform in the course.

Day - Date	**Exp.**	**Title**
9/11-12	1	Electric Field Simulations
9/18-19	2	Cathode Ray Tube
9/25-26	3	Ohm's Law (Parts 1-3)
10/2-3	4	Ohm's Law (Parts 4-5)
10/9-10	5	RC Circuits
10/23-24	6	Magnetic Deflection
10/30-31	7	Induction
11/6-7	8	Determination of *e/m*
11/13-14	9	Oscilloscope
11/20-21	10	AC Circuits (Part 1)
11/20-21	11	AC Circuits (Part 2 & 3)

Grading:
The underlined experiments require written lab reports from each student. The written reports are worth 100 points each. Every other lab experiment is based on participation. Coming to lab and doing what is expected will equal 25 points.
Your final letter grade is determined by adding all points earned on the reports and labs and then using the following scale:

A (500-470) B (469-440) C (439-410) D (409-380) F (<380)

.

Absences:
If you cannot make it to a lab meeting, make arrangements with me before the meeting to do the experiment. No make-up labs will be arranged after the fact. You may come to lab on a day different than your regularly scheduled day with prior approval.

A Good Lab Notebook:
A good lab notebook is a bound notebook. Recorded information is always dated. Entries are written in ink. Recorded data is organized, such as in tabular form. The units of physical quantities are always displayed. An incorrectly recorded value is not erased or scratched out. Rather, a single line is drawn through the value and the correct value is written next to the incorrect value. Graphs are included in the lab notebook. If the graph is done on a separate sheet, the sheet is stapled or taped into the lab notebook. Graphs are titled and the axes have labels with appropriate units. Results and conclusions are written in a comprehensible form. The general rule to follow is this: A person with a lab manual should be able to read your lab notebook and understand the entire experiment.

Written Reports:
A report is usually due one week after the experiment is performed at the beginning of the lab session. Late reports will be accepted at a penalty of 4 points per day. After five days, the penalty will not increase from 20 points and late reports will be accepted up until the last class day of the session. (However, this is a severe penalty and I advise against turning in reports this late. For that matter, I advise to turn all of your reports in on time.)

The written reports must have the following elements:

1. Title Page (title of experiment, date, your name, name(s) of partner(s))
2. Experimental Objective (few sentences in <u>your own</u> words)
3. Raw Data (measured values with units)
4. Calculations and Calculated Data (for <u>each</u> equation used, state equation & show a sample calculation with units)
5. Plots, if any (label axes, show slope calculation if needed)
6. Other Results (include your answers to the questions raised in the manual or raised by me in the lab session, be sure to discuss each plot, calculate percentage differences when comparing quantities, include any other relevant results that you may have found)
7. Discussion of uncertainties and accuracy of results (be as <u>quantitative</u> as possible, estimate effect of experimental errors on results, identify the largest source of error)

The reports must be typed (e.g. Word) and the graphs must be done using plotting software (e.g. Excel). Complete sentences should be used to express your thoughts in an organized fashion. You will be penalized for incorrect spelling and grammar