Physics 104 Laboratory
Spring 2020

Instructor: Mrs. Bonnie W. Price
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Course Meeting: Trexler 273
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Office Phone: 540-375-2408
Office Hours: M: 1:00 pm – 3:00 pm
T: 12:00 pm – 1:00 pm
TH: 5:00 pm – 6:00 pm
Other Times By appointment

Required Materials:

Pre-lab materials are available online through Inquire and should be printed and completed ***before*** coming to lab. Lab instructions will be posted on Inquire and you are required to print and bring the handout to lab. A bound lab notebook with sewn graph paper pages is needed, as well as a scientific calculator that is not a cellphone, and a pencil or pen.

Goals:

The following five goals will serve as the framework for the activities within the Lab: *the Art of Experimentation*, *Experimental & Analytical Skills*, *Conceptual Learning*, *Communication*, and *Collaborative Learning Skills*. New experimental techniques will be introduced, as well as analytical tools in dealing with errors. Hopefully the laboratory experiments will clarify and expand concepts introduced in Physics 104 lecture, while practicing report writing and your ability to clearly communicate accurate results to your colleagues and instructor.

Intended Learning Outcomes:

Upon completing this course, students will be able to

- Conduct scientific experiments and obtain accurate data
- Discuss the results of an experiment quantitatively and qualitatively
- Identify sources of error that appear in experimental methods and
- Communicate experimental results in a coherent, well organized, written manner.

Attendance Policy/Make-up Labs:

Since 25% of your 104 grade depends on the laboratory, *you must enroll in both the "lecture" and laboratory sections of 104*, and **all experiments must be completed** or your lecture final grade will be reduced a letter grade. Furthermore, you may *only* attend the lab section for which you are registered, unless you have explicit permission from the instructor, and switching lab sessions is allowed only once per semester. The lab starting and ending times are firm, although it may be possible to complete the lab before the published ending time. One missed lab may be completed during the make-up week at the end of the semester, and the report from that make-up lab is due within five days of the completed experiment.

Five percent of your laboratory grade is determined by attendance and participation, as an average of the weekly grades, based upon a ten-point scale. It is expected that each student attends the lab, willing to assist with all parts of the experiment and with all of the needed materials. Reductions up to five points for each of the following may be given: failure to be on time, not actively participating in data collection and analysis, forgetting your lab notebook and working calculator, ***failure to complete the experiment by the allotted time***, and attention to your cell phone instead of the experiment. Weekly participation grades will be posted in the Inquire grade book.

Pre-lab Assignments:

The purpose of the pre-lab assignment is to introduce the material that will be investigated during the lab, therefore pre-lab assignments are due at the ***beginning*** time for the lab session, and are worth 10 points. Prelab assignments are posted on Inquire for each of the experiments. The assignment is to be printed and completed, or the answers written on a sheet of paper, and then submitted at the beginning of lab. Most of the prelab assignments contain simulations, so it is suggested that access to the simulation be tested before lab is scheduled to meet. The answers to the pre-lab will be discussed at the beginning of the lab session, so it must be received before that discussion begins in order to be worth 10 points. Any pre-lab assignment submitted after the beginning time for the lab will receive 0 points.

Lab Notebooks:

Each student is to purchase and bring a bound notebook with graph paper pages to lab each week. Due to the time limitations during lab, the notebook check will be brief. A well-organized notebook is easily detectable at a glance, so pay close attention to formatting procedures outlined in the lab notebook document. The goal of the lab notebook is to practice recording data and results in a well-organized and legible format.

Each student will have their notebook checked before leaving lab and will be graded on a 20 point scale. In order to receive the full 20 points, the notebook entries must be formatted correctly. If a student leaves lab without having their lab notebook checked, because they either forgot their notebook or did not complete the experimental data collection and analysis, they may have the notebook checked ***before the next lab for a maximum of ten points***.

Lab Reports:

Since one of the course objectives is to communicate experimental results in a coherent, well organized, written manner, it is important to practice writing lab reports. The *Data and Results* section, as well as the *Abstract*, were written and submitted in Physics 102/103 Lab. These sections will also be written this semester, along with the introduction of the *Discussion* section. A separate document will describe the format and content of each section, and will include a grading rubric.

Reports will be divided into two types: A and B. The A-type report is one that requires less analysis and thought than the B-type report. This report may involve submitting group data, following a tutorial for creating a particular graph or table, answering questions, or writing an analysis in lab on the meaning of a data set. The A-type report may be completed in lab, or submitted through Turnitin. An abstract, data and results section, or a discussion section are examples of B-type reports. These reports will be created individually outside of class, and submitted through Turnitin. All reports submitted through Turnitin via a link on the lab's Inquire page will be due at 11:59 pm the Sunday of the following week.

All individually submitted reports must be your own work. If the submission is a graph that was originally created during lab, it still must be recreated by you for the report, and not simply copied and pasted from the original person who graphed the results. The time stamp placed on the email by the server will determine when the work was submitted. ***Unless an extension is granted beforehand***, all late items will be reduced by 10% for each 24-hour period beyond the due date/time, for school days, Monday through Friday. As a result, after one week, assignments receive a 50% reduction and after two weeks, assignments receive a 100% reduction; that is, no assignment will be accepted if more than two weeks late. Every report submission is worth 50 points. The lowest A lab report grade and the lowest B lab report grade will be dropped at the end of the semester.

Academic Integrity:

Although students working within the same group will have the same data, recording of the data into the lab notebook is to be completed individually, written in table format. Excel graphs created during lab time may be shared by group members, and secured in each student's lab notebook. Error values are to be calculated individually in lab notebooks, as well as sample calculations using the data. Results should be recorded in each student's notebook.

All electronically submitted lab reports will be written individually, and must be each student's original work, except for shared data. All reports electronically submitted will come through Turnitin. The college's academic integrity policies will be enforced.

Grading:

All grades will be recorded on Inquire. Do not discard any graded work until the end of the semester. If there is a discrepancy between the grade recorded on Inquire and on the report, proof of the grade must be produced in order for the grade on Inquire to be changed.

At the end of the semester, your overall lab average will be sent to your lecture instructor. No curves will be applied to your lab grade. The final lab average will be determined upon the following:

Attendance/Participation	**5%**
Completed lab notebook	**10%**
Pre-labs	**10%**
Weekly lab reports	
A type reports	**30%**
B type reports	**45%**

Electronic Devices Usage Policy:

Computers in the lab are networked and you are required to log onto them with your username and password***. Do not save any work to the lab computers*** unless you save it to your Z: drive or onto a personal USB device; all other drives are purged when you log out. During the class, the computers in this room are to be used only for the completion of assignments directly associated with this course. **Computers, including laptops and tablets, are not to be used to check email or access the Internet for personal reasons during class**.

Out of courtesy to others, **all cell phones should be silenced or turned completely off upon arrival to class and should be out of reach**. If you are engaged with your cell phone, then you are not engaged with your lab partners and the experiment, and your participation grade will be reduced. You have been warned, so no additional warning is needed. Also, MP3 players, cameras and other personal devices are not to be used during class. Personal laptops and calculators may be used as directed.

Additional Policies:

No food or drinks are allowed in the lab, except for screw top water bottles and closed drink containers. Also, no tobacco products are allowed in lab.

Students should work in groups of two or three depending upon the section's enrollment, and may select their group members initially. Students will be rotated to different groups throughout the semester, and responsibilities within the group should rotate as well, so that each member learns how to use Excel, LoggerPro, and helps conduct the experiment. Each

member of this class is expected to treat everyone with respect, contribute to a welcoming and inclusive environment, and equally contribute to the work during lab sessions.

Course Outline:

Date	Lab Topic	Report Type
January 21	Course Policies Experiment 1: Electric Field Mapping	A
January 28	Experiment 2: Electric Circuits	A
February 4	Experiment 3: RC Time Constant	B: Discussion
February 11	Experiment 4: Magnetic Fields	B: Data and Results
February 18	Experiment 5: Electromagnetic Induction	A
February 25	Experiment 6: Reflection and Refraction	A
March 3	Spring Break!	
March 10	Experiment 7: Lenses and Mirrors	B: Discussion
March 17	Experiment 8: Diffraction	B: Abstract
March 24	Experiment 9: Hydrogen Spectra/TBA	B: Data and Results
March 31	Experiment 10: Radioactivity	B: Abstract
April 7	Experiment 11: Shielding/TBA	A
April 14	Makeup Week	Required Report