

**Dr. Rama Balasubramanian (a.k.a) Dr. Bala**

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Office Hours: MWF 11am-12 noon; Th 1-2 pm; Additional Hours: By Appointment

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**Required Materials:**

Pre-lab materials are available online through Inquire and should be printed and completed *before* coming to lab. One lab handout per table will be available for use during lab, and if you wish to print your own copy, the document will also be posted on Inquire. A bound lab notebook (sewn pages, not spiral bound) with 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 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.

**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:

- |                                   |            |
|-----------------------------------|------------|
| • <b>Attendance/Participation</b> | <b>5%</b>  |
| • <b>Completed lab notebook</b>   | <b>10%</b> |
| • <b>Pre-labs</b>                 | <b>10%</b> |
| • <b>Weekly lab reports</b>       |            |
| ○ <b>A type reports</b>           | <b>25%</b> |
| ○ <b>B type reports</b>           | <b>50%</b> |

**Attendance Policy:**

Since a portion of your 104 grade (25%) 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 both instructors before the earlier lab section, 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. Make-up labs will only be permitted as

a result of a discussion with the lab instructor *beforehand* or an emergency note (death, hospitalization, misdemeanor, etc.) *signed* by a governing official (medical doctor, parent, law enforcer, etc.).

Five percent of your laboratory grade is determined by attendance and participation, an average of the weekly grades, according to the rubric:

10 points	Comes prepared for class with working scientific calculator Actively participates in lab procedure, data collection/analysis, and discussion Understands the purpose of the lab, working efficiently to complete the lab on time Rotates through different tasks within the group Cellphone does not appear during the lab session Does not leave the lab more than once
5 points	In attendance, but may have been tardy May have forgotten scientific calculator, or fails to use it to calculate results May complain or waste time on other tasks unrelated to lab procedure or purpose Cellphone not silenced before lab session May use their cellphone to text others or check messages during lab session May have left the room more than once May be unwilling to attempt different tasks, preferring to keep the same task each lab Does not complete the lab by the set ending time
0 points	Absent from lab

**Make-Up Labs:**

A make-up lab session is scheduled for the last week of classes. If you have missed a regularly scheduled lab and, according to the previously stated attendance policy, you have discussed this absence with the instructor before missing that lab, or have an emergency note for the missed lab, then you may attend the makeup session. Only ONE lab may be scheduled for the make-up time. If the report is an in-lab assignment, it is to be completed before leaving the make-up session. If the report an individual report, then it is due five days from the makeup session.

**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. If the pre-lab is submitted at any time after the beginning of the lab session but before the end of the lab, due to computer problems opening the simulation or for other reasons including being tardy to lab, the maximum number of points possible decreases to 5 points. Any pre-lab assignment submitted after the ending time for the lab will receive 0 points. 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. The lowest pre-lab grade will be dropped at the end of the semester.

**Lab Notebooks:**

Each student is to purchase and bring a bound notebook with graph paper pages to lab each week. A separate document will explain the format to be used in the notebook. *Each student* will have their notebook checked before leaving lab and will be graded as follows:

10 points	Notebook entries are organized and formatted according to set guidelines
5 points	Entries are haphazard, illegible, not formatted according to set guidelines Data were recorded in lab notebook, but not in table format. Error or sample calculations were not shown, or were incomplete. Results were not stated, or were not in table format. Graphs were not properly printed, or did not contain adequate information.
0 points	Student did not bring lab notebook, or left before the notebook was checked

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.

### **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 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.

All individually submitted sections will be submitted through Turnitin via a link on the lab's Inquire page, and will be due at 11:59 pm the Sunday or Tuesday of the following week, depending upon your lab time. Tuesday lab sections will have their reports due at 11:59 pm on the following Sunday, and Thursday lab sections will have their reports due at 11:59 pm on the following Tuesday, when submitted through Inquire. **Any group reports will be submitted before the end of lab, before any member of the group exits the lab.**

Reports will be divided into two types: A and B. The A-type report is one that requires little individual thought. This report may involve submitting group data, following a tutorial for creating a particular graph or table, 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. B-type reports require more thought and analysis than A-type reports. An abstract, data and results section, or a discussion are examples of B-type reports. These reports will be created outside of class and submitted through Turnitin.

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 20 points. **The lowest lab report grade, either an A- or B-type report, will be dropped at the end of the semester. One B-type report with a low grade may be rewritten and resubmitted, to improve the report and the grade, as long as it is submitted through Turnitin before 11:59 pm on Sunday, April 24, 2016.**

### **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.**

Electronically submitted lab sections 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.

### **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, 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 sight. If you are using your cell phone during lab or have your phone visible on the table, then the instructor may assign a zero or five as the participation grade for that lab. If you are engaged with your cell phone, then you are not engaged with your lab partners and the experiment. 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 canteens. Also, no tobacco products are allowed in lab. Students should work in groups of 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.

**Course Outline:**

<b>Date</b>	<b>Lab Topic</b>	<b>Report Type</b>
January 26/28	Course Policies Experiment 1: Standing Waves in Strings	A
February 2/4	Experiment 2: Electric Field Mapping	A
February 9/11	Experiment 3: Electric Circuits	A
February 16/18	Experiment 4: RC Time Constant	B
February 23/25	Experiment 5: Magnetic Fields	B
March 1/3	Experiment 6: Electromagnetic Induction	A
March 8/10	<i>No Lab: Spring Break</i>	
March 15/17	Experiment 7: Waves	B
March 22/24	Experiment 8: Reflection and Refraction	A
March 29/31	Experiment 9: Diffraction	B
April 5/7	Experiment 10: Lenses and Mirrors	B
April 12/14	Experiment 11: Food Calories	A
April 19/21	Makeup Week	