

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

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Office Hours: MWF 10:30-11:30am; T Th 1:30-2:30pm; Other Hours: By Appointment

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### **Required Materials:**

Pre-lab materials are available online through Inquire and should be completed *before* coming to lab. Lab handouts will be available for use during lab and also will be posted on Inquire, if you wish to print your own copy. A bound lab notebook (sewn pages, not spiral bound) with graph paper pages is needed, as well as a scientific calculator.

### **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 successful 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:**

Since a portion of your 202 grade (20%) depends on the laboratory, *you must enroll in both the "lecture" and laboratory sections of 202*, and all experiments must be completed. If any lab is not turned in by the end of the semester, your course grade *will be reduced by one whole letter grade*. The starting and ending times of the labs are firm, although it may be possible to complete some experiments 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.).

### **Make-Up Labs:**

A make-up lab session is scheduled for the last week of classes. If you attend the make-up session due to a legitimate academic conflict and provide documentation, then you will receive full credit for the lab. If you attend the make-up session without documentation or prior authorization, then you will receive only half credit.

### **Pre-lab Assignments:**

The purpose of the pre-lab assignment is to introduce the material that will be investigated during the lab, therefore students are expected to complete the pre-lab assignments before the lab session. The answers to the pre-lab will be discussed at the beginning of the lab session.

### **Lab Notebooks:**

Each student is to purchase and bring a bound notebook with graph paper pages to lab each week. Alternately, you can use the same lab notebook from Phys 201 Lab if you have enough pages. For those of you using Phys 201 lab notebook, leave two pages blank and place a sticky tab to clearly indicate where 202 lab pages begin.

A Table of Contents will be created on the first two pages of the notebook. . The third page will begin the lab activities, and each new lab will begin on the right hand page with the lab title, date of the experiment, and page number. The right hand pages should include the recording of the data, written *neatly* in table format, results in table format, all sample calculations for the results and error analysis, and answers to the stated lab questions. Units should be included in all column headers and with all results. Graphs printed while in lab should be pasted on the left hand pages, printed so that they fit on the page when pasted into the lab notebook without extending past the edge of the page. Everyone should record answers to discussion questions in complete sentences on the right hand pages of their lab notebook.

***Each student*** will have their notebook checked before leaving lab and will be graded as follows:

10 points	Your notebook entries are organized and thorough. All data were recorded into lab notebook using the acceptable format, with graphs correctly pasted. Results are in table format. Error and sample calculations are shown and are correct. Units are included where appropriate. Graph axes are labeled.
5 points	Your notebook entries are haphazard, illegible, do not include units, <i>or</i> you were tardy, not prepared for class, or left early. 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.
0 points	Student did not bring lab notebook, did not record data/results into notebook, or did not submit notebook before leaving lab.

Due to the time limitations during lab, the notebook check will be brief and each week a different part of the lab information will be checked. At the beginning of the last week of classes, each student will submit their lab notebook and one lab will be thoroughly graded.

### **Lab Reports:**

Since one of the course objectives is to communicate experimental results in a coherent, wellorganized, written manner, it is important to practice writing lab reports. Lab reports in this course consist of four sections: *Abstract, Introduction, Data and Results, and Discussion*. In order to have students create a well written lab report, each of these four sections will be taught throughout the semester. The content of each new section will be discussed in lab first, and each lab group will create and submit that ***typed*** section for a group grade. *Equations must be typed using the MS Word equation editor*. The following week, the group submitted section will be returned, and copies will be provided to each group member so that the comments provided on the group activity will enhance your individual submissions. All group members

will receive the same grade on the group reports, since it is believed that all group members have contributed equally to the report.

When an individual report is indicated on the course outline, the work submitted must be your own work. Lab reports are to be submitted electronically, through the Inquire link, within 72 hours of the end of your lab section, i.e., all reports must be submitted by 11:59 pm on Sunday following your Thursday's lab. 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 5 points for each 24 hour period beyond the due date/time. **As a result, after one week your lab reports will receive a 100% deduction. No reports will be accepted past the 100% deduction period.**

Every submission is worth 20 points. There will be two full lab reports, towards the end of the semester that comprise all four sections, namely Abstract, Introduction, Data and Results and Discussion. The lowest A-type lab report grade will be dropped at the end of the semester, with the exception of final reports 1 and 2.

### **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 chart 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.

Submitted lab sections will be written collectively by the group one week, and then individually submitted another week. Individual submissions must be each student's original work, except for shared data. All reports will be electronically submitted, through Turn-It-In. The college's academic integrity policies will be strictly enforced.

### **Attendance:**

Students are required to all labs. Attendance will be recorded. You cannot pass the course without completing all the labs. Any student who misses two labs will be dropped from the course with a grade of DF. This includes both excused and unexcused absences. A warning email will be sent after the first absence occurs. This will be cc-ed to your academic advisor and registrar. Absences will also include the following: **If a student shows up for lab 10 minutes late/walk out in the middle of the class/caught napping/not participating in lab work/texting/ checking emails/browsing/playing games/watching videos, he/she will be marked absent.** In addition, I will consider texting/checking emails/browsing internet all as a form of violation of professional academic code. A physical presence alone does not construe as being present in the class.

Excused Absence: Any unexpected absence due to health reasons/emergency situation/participation in a conference or sporting events representing the College should be supported by proper documentation such as doctor's note, court order, and schedule of conference/sports events. You will need to inform me prior to the absence or within 48 hours of such an absence to be considered as excused so that you can make up for that lab during the last week. It is best to inform me about your absence in person. Emails and phone voice messages are not very reliable. It is your responsibility to make up for the work that you missed. I will not extend the deadline for turning in assigned work unless you have my prior approval.

**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. 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>15%</b>
<b>Weekly lab reports</b>	
<b>A-type reports</b>	<b>30%</b>
<b>B-type reports</b>	<b>50%</b>

**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 turned completely off** upon arrival to class and should be out of sight. 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, 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.

**Lab Outline:**

Date	Lab	Report Type	Submission	Due Sunday Night at 11:59pm
30-Aug	Simple Harmonic Motion	Abstract	Group	2-Sep
6-Sep	Simple Harmonic Oscillator	Abstract	Individual	9-Sep
13-Sep	Resonance	Data and Results	Group	16-Sep
20-Sep	Exam 1 Review			
27-Sep	E-field / Gauss's Law	Introduction	Group	30-Sep
4-Oct	Resistance Heating	Data and Results	Individual	7-Oct
11-Oct	Review for Exam 2			
18-Oct	Fall Break : No Lab			
25-Oct	Electrical Circuits	Discussions	Group	28-Oct
1-Nov	Magnetism	Discussions	Individual	4-Nov
8-Nov	Biot-Savart Law	Full report 1 (Abstract, Intro, Data & results, Discussions)	Group	17-Nov
15-Nov	Review for Exam 3			
22-Nov	Thanksgiving : No Lab			
29-Nov	Ray optics	Full Report 2 (Abstract, Intro, Data & results, Discussions)	Individual	9-Dec

6-Dec	Make up Lab			
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