

## *General Physics Lab Physicist ~ Beth Roberts*

<http://www.phy.olemiss.edu/~broberts/>

### **Required**

*General Physics Laboratory Manual*, 2009 ~ 2010 Edition; Composition Notebook; Calculator with trig functions; Pen; USB drive

**ATTENDANCE** is required. Three (3) absences result in a grade of F. If you miss lab you will receive a grade of zero (0) for each missed assignment. You are not permitted to attend a different section or make up experiments. There will be one drop grade for each of the following categories: Quiz, Written Exam, Partial Lab Report. Verification for an absence due to illness (doctor) or family emergency (parent) must be given to your *Professor of Record* immediately upon your return to campus. Verification for participation in a University group (advisor, coach) must be provided prior to your absence. Only two (2) absences are allowed, regardless of the reason. A third absence will result in a grade of F.

**HOMEWORK** - Read all syllabi given at the first class meeting. Read Page 1 through Page 5 of your lab manual. Read documents numbered 1 through 5 on the Lab Physicist's website. Complete the *Physics Take-Home Math Exam Phys 223 (Phys 224)*, front and back. If you need help → Room 104 Lewis Hall. Prepare for the first experiment; refer to the *Lab Calendar*. Complete the *Pre-Lab* for the first experiment.

### **GRADE INFORMATION**

Except for the *Take-Home Math Exam*, every assignment is an *individual* effort. Honor and integrity are expected and enforced. All assignments are due/given at the *beginning* of lab. An assignment is a pre-lab, quiz, report, or exam. Verify *Blackboard* grades weekly; you have a limited time to correct grading mistakes. *Blackboard* grades are not official.

- *Pre-Lab* (possible penalty) – Checked for completion only. If it is incomplete or late there is a 10-point penalty on the corresponding quiz grade. Each one is perforated; tear it out, clean up the edges, and turn it in.
- *Quiz* (100 pts) – Timed. The focus is on the current experiment each week.
- *Report* (up to 100 pts) – Written for each experiment you perform. The required formats are on Page 4 and Page 5 of the lab manual. Lab reports are due at the beginning of the next class. Partial lab report grades will be converted to a percent grade.
- *Exams* –
  - **2 Math Exams:** 100 pts each. The *Take-Home Math Exam* is due at the beginning of the 2<sup>nd</sup> class. The 2<sup>nd</sup> math exam (timed) is given at the beginning of the 2<sup>nd</sup> class.
  - **Written Physics Exam:** 100 pts each. The focus is on the previous experiment each week.
  - **1 Practical Physics Exam:** 100 pts. The practical exam is given during your regular lab time.
- Grades will be posted on *Blackboard* so that you can verify and keep track of your grades in lab. Any mistake(s) in grading must be corrected within one week. Keep all graded assignments until your final grade is posted at the end of the term. Grades will not be corrected without the TA-graded assignment.

**Final Grade** – Quiz Avg: 10% Report Avg: 50% Written Exam Avg: 15% Math Exam Avg: 10% Practical Exam: 15%

**Letter Grade** -    ≥ 90.0: **A**;        ≥ 80.0: **B**;        ≥ 70.0: **C**;        ≥ 60.0: **D**;        < 60.0: **F**.

If revisions are necessary you will be notified in writing prior to implementation of the new policy.

# Department of Physics and Astronomy

## General Physics Laboratory Policy

### **WELCOME TO PHYSICS LAB!**

#### **General Physics Laboratory has the following objectives:**

- To reinforce lecture material by performing experiments that emphasize fundamental concepts of physics
- To learn the proper use of equipment
- To learn experimental lab techniques
- To gain an appreciation of the inherent uncertainties of all measurements
- To improve skills in the recording of data and the writing of scientific reports
- To understand and perform simple data analysis

#### **To accomplish these objectives, you will need to do the following for each experiment:**

- *Before lab:*
  - i.* Read the *Advance Reading* material specified for each experiment. Each experiment refers you to particular topics, concepts, and/or terms in your textbook. Consult the *Table of Contents* or *Index* of your text to locate the information. Some experiments also require reading lab manual appendices.
  - ii.* Read and understand the *Theory* section from your lab manual. Read the *Procedure*.
  - iii.* Complete the *Pre-Lab* from your lab manual. The *Pre-Lab* will prepare you for, and enhance your understanding of, the experiment you are to perform. Turn this in at the beginning of lab.
- *Coming to lab:* Bring your lab manual, lab notebook (must be a composition notebook), pen, and scientific calculator. You will not be allowed to participate without your lab manual.
- *Beginning the lab:* A quiz will be given at the beginning of class. If you arrive late, you may not have time to complete the quiz. Questions for the quiz will focus on the current experiment and are taken from the *Advance Reading*, *Theory* and *Pre-Lab* material.
- *During the lab:* Your teaching assistant (TA) will give an introduction (summary of the physics concepts and theories being investigated, equipment use, and safety rules) for each experiment. You and your partner will perform the procedure as a team. *Data* (all information and observations obtained during lab) will be recorded in your lab notebook in *ink*. Note that units for physical quantities will be important all semester. Always record the units! You will need organized data to write your report. Data tables will not generally be provided for you; make appropriate tables and charts as needed. If you make a mistake, draw a single line through the error(s), and then record again next to it (them). *Do not* attempt to obliterate the error(s). Note that when taking exams you will not have a partner! Be certain that you understand experiment procedures by changing responsibilities as you perform each experiment. Data must be initialed by your TA when you finish the experiment. You will need to organize your equipment and close computer software and folders prior to asking the TA to initial your data. Be sure you have and understand all pertinent information before leaving lab.
- *After lab:* Write an individual *Lab Report* (lab reports must be typed). The lab report formats are provided on Page 4 and Page 5. Most reports will require the insertion of one or more tables. Equations may be neatly handwritten in *ink*. Turn this in at the beginning of the next lab (during summer terms: two days after the experiment).
- *Next class meeting:* Turn in your *Pre-Lab* for the current experiment and your *Lab Report* for the previous experiment at the beginning of class.

# Department of Physics and Astronomy

## General Physics Laboratory Policy

### **Resources**

These requirements may seem a little overwhelming. The Department of Physics and Astronomy offers support to help you succeed. Your Lab Physicist, TA, and Professors have office hours to help you with physics questions. When you require help with lab, your best resource will be your TA or Lab Physicist. However, the Department of Physics and Astronomy also provides “The Physics Learning Center” (*a.k.a.* the Tutoring Room) located in Room 104 of Lewis Hall. A tutoring schedule is posted early in the semester. Tutors are not available during final exams. Tutors are upper-division physics majors, physics graduate students, Lab Physicists, and Professors. Note that tutoring involves helping students understand physics concepts and the proper methods for solving particular types of physics problems. Tutoring does not involve giving students an answer.

Computers with tutorials and physics software are also provided for your use in the tutoring room. Please ask for assistance with equipment if needed. Printing is not available for students in this department. It is advised that you write and print your lab report at least a day before your lab meets so that unexpected problems do not affect your grade. Late reports are penalized; refer to *General Physics Lab Policy*, Page 3. If you do not have your own computer and printer, *please* purchase a jump drive so that you can save your reports and print them from an Ole Miss computer lab.

The Lab Physicist and each TA for General Physics has a Web site where relevant and useful information can be found. Your TA will inform you of the URL for their Web site. Your Lab Physicist Web site includes links to experiment information, the lab calendar and changes to the calendar, tutoring schedule, tutorials, and miscellaneous information. You are strongly advised to visit your Lab Physicist Web site at least weekly! The URL for your Lab Physicist is

<http://www.phy.olemiss.edu/~broberts/>

**General Information ~ Refer to your TA’s syllabus for specifics.**

**Quiz** – Quiz questions are designed to encourage you to arrive prepared for the current experiment. The questions are chosen from the *Advance Reading* (textbook and lab manual appendices), *Theory*, and *Pre-Lab* (lab manual) material that is specified for each experiment.

**Exams** – There will be at least two math exams at the beginning of the semester. Refer to your TA’s syllabus for additional exam information. All exams given in class are individual efforts.

The first math exam will be a take-home test; the test is included in this lab manual, Appendix D. You may use any resource you like; the goal is to refresh your knowledge of algebra and trigonometry. It is due at the beginning of the 2<sup>nd</sup> class. The second math exam will be given at the beginning of the 2<sup>nd</sup> class; all in-class exams are individual efforts. Although this is not a math class, please note that college algebra and trigonometry are required tools for this level of physics.

When physics exams are given, note that the exams are designed to determine how well you have met the course objectives (*i.e.*, your understanding of physics concepts, proper use of equipment, lab techniques, recording of data, and data analysis) after all relevant tasks have been completed (*i.e.*, *Advance Reading*, *Theory*, *Pre-Lab*, *Quiz*, *Procedure*, *Lab Report*). Your TA’s syllabus will provide details regarding physics exams (no partner for in-class exams).

**Lab Report** – Refer to the *Lab Report Format* on Page 4 and Page 5. Laboratory reports should be written in the passive voice and in the third person. For example, you would write “the measurement was taken” rather than “I made the measurement.” You are trying to convey how a physics concept, principle, or theory was investigated, whether or not it was consistent with the theory, and relevant sources of uncertainty inherent in the method of investigation. You do not need to write a textbook, just a clear and concise report. Lab reports must be typed.

Please spell check and proofread your report; proper grammar and spelling are important. Always show your work, explain your reasoning, and include the units!

Specific information for particular sections of your report can be found in the appendices (*e.g.*, the correct equation to use when comparing values for the *Results* section, sources of uncertainty for the *Discussion of Results* section, analyzing graphs for the *Equations/Graphs* section).

# Department of Physics and Astronomy

## General Physics Laboratory Policy

### ***Attendance is mandatory.***

You must attend the section for which you registered.

A grade of zero is given for each missed assignment (*e.g.*, pre-lab, quiz, report, exam). Three (3) absences for the semester will result in failing the class (a grade of F). Refer to your TA's syllabus for additional information.

### ***Grading Errors***

All grading errors must be addressed by you within one week. If you believe too many points were deducted, first talk to your TA. If the issue is not resolved to your satisfaction, your TA will take it to the Professor of Record. The professor's decision is final. If grades are recorded incorrectly, you must bring the TA-graded assignment with you to correct the error. Grades cannot be corrected without the TA-graded assignment.

### ***Honor***

You will be part of a team while performing an experiment. However, each assignment (except for the take-home math exam) is an individual, not team, effort. A grade of zero will be given to every participant of unauthorized duplication. These grades will not be adjusted. Your professor may apply more severe penalties. Other forms of dishonesty may carry more severe penalties.

### ***Punctuality***

We encourage you to be on time and prepared for lab. Each quiz and exam is timed. You may not have time to finish if you arrive late.

Late lab report penalties are stated below. Weekends and holidays when Ole Miss is closed are not counted.

1. Up to 24 hours late, the penalty will be 10 points.
2. 24 to 48 hours late, the penalty will be 30 points.
3. No credit will be given after 48 hours.

### ***Important Items to Know and Remember***

- You must bring your lab manual to each class. You may not attend lab without the manual.
- Record data in your lab notebook in *ink*. Always record the uncertainty of each measurement and the unit for the quantity you measured or calculated. If you forget to bring your lab notebook or record data in ink, there will be a penalty on your *Lab Report* grade (refer to the *Lab Report Format*, Page 4 and Page 5).
- If a question or quantity is asked for in multiple sections of the report, then you need to provide it in each section.
- *Always* show your work, explain your reasoning, and include units.
- General Physics Laboratory requires proper *graphing* and *analysis of graphs*. Refer to *Appendix B*.
- Keep all graded assignments until your grade is posted at the end of the semester. Grading errors can not be corrected without the TA-graded assignment.

# Department of Physics and Astronomy

## General Physics Lab Report Format

### **TITLE**

**FOCUS (10 pts) In your own words:**

- State the theory and the objective that are the focus of the experimental procedure.
- Summarize the method of investigation (procedure) in 3 to 5 sentences.
- Define all terms relevant to the experiment.
- Explain the principles and/or theories that were investigated and how the investigation was accomplished. This does not mean that you rewrite the procedure! Consider, for example, *Experiment 7: Coefficients of Friction*: “To accomplish this investigation, one is required to pull the object at a constant velocity. The acceleration, and thus the net force, equals zero permitting determination of the frictional force.” Reference your results where appropriate (e.g., “Refer to Table 1, below”).
- Explain mathematical relationships in the context of how and why they were used in the investigation. Mathematical relationships would include terms such as “directly proportional to” or “sinusoidal” not the equations themselves.

### **EQUATIONS/ GRAPHS (15 pts)**

- This section will include all equations used, the way they were used, and what the equations represent. As all calculations used should be in your lab notebook, please reference this resource. Be certain you include all equations used both for the procedure *and* for the report.
- Graphing data will require you to use *Graphical Analysis* software. The software will analyze the graph based on a “general equation” that you specify. You will then perform additional mathematical analysis on the graph to obtain information relevant to the experiment. Refer to *Appendix B* for free download information and instructions. Attach graphs to the end of the report.

### **RESULTS (15 pts)**

- Present select, organized information in a format provided by your TA. This is typically a table format where quantities derived from data are inserted and compared. Label each table (e.g., Table 1) and include a descriptive title. This section emphasizes the theory and/or the objective of the experiment. You may be required to assume the responsibility of selecting the relevant information as the semester progresses.

### **DISCUSSION OF RESULTS (25 pts)**

- Discuss your results with respect to the theory and objective of the investigation (you stated both in the *Focus* section). Are your results consistent with the theory? Relate this analysis to your discussion of uncertainty and any assumptions necessary for the procedure. Note that a single experiment will not prove or disprove a theory. Theories are accepted or rejected on the basis of a large body of evidence.
- State sources of uncertainty and ways to reduce them. As stated in *Appendix A*, “Systematic Error” and “Personal Error” are not valid sources of uncertainty! You will want to consider the method(s) used for the experiment, as well as any assumptions involved that may not be valid. It may be useful to assume you performed all parts of the procedure correctly and your equipment was perfect; why aren’t your results “perfect”? Think about the method(s).
- Discussion topics will be supplied by your TA (only when relevant). Discussion topics are intended to connect concepts and theories from various experiments that have been performed.

### **QUESTIONS (25 pts)**

- Type the questions that follow each experiment. Answer the questions in your own words, using complete sentences. Always show your work, explain your reasoning, and include units. Calculations may be done neatly in *ink*.

### **DATA (10 pts)**

- Attach a *photocopy* of your initialed data. (Failure to bring or use your lab notebook will result in a penalty on your lab report.)

# Department of Physics and Astronomy

## General Physics Partial Lab Report Format

### *COVER SHEET*

- Experiment Name
- Your Name
- TA's Name
- Date
- Your Partner's Name

**RESULTS/GRAPHS (25 pts)** If the report has both results and graphs: *Results* (15 pts.), *Graphs* (10 pts.)

- Results are usually tables in a format given by the TA. You must insert tables into your document, then fill in the tables with the required information. Each table will have a label and a descriptive title. For example:

*Table 1: Acceleration of a Cart*

- Graphs must be complete (Appendix B) and attached to the end of the report.

### *QUESTIONS (25 pts)*

- Type each question. Then answer the question. If words are needed, proper grammar is required. If mathematical equations are required, you must start at the beginning, then show each step in the solution. Note that “just the answer” is worth 0 points.

### *DATA (10 pts)*

- Attach a *photocopy* of all of your data for each experiment. You must use your lab notebook to record data unless data tables are provided in the lab manual. You must use ink – *always*.

*A partial lab report is worth 60 points, plus points for additional sections when assigned; refer to Page 4 of your lab manual for these values. For example, if the “Focus” section is assigned, it will add 10 points to the total value of the report or 70 points.*