Physics 201 Laboratory : Spring 2016

Instructor:	Daniel Robb	Lab Room:	Trexler 274
Email:	robb@roanoke.edu	Lab Time:	Th 2:50–5:50
Office:	Trexler 266B	Office Hours:	MWF 9-11, Th 9-11 and by appt

Required Materials

A scientific calculator and a lab notebook (a bound notebook with graph paper pages) are required. Lab instructions will distributed in laboratory meetings, and will also be posted on the class Inquire site.

Motivation

Laboratory classes are excellent practice for building your skills at (i) working in teams on challenging projects, and (ii) expressing yourself clearly in written, and particularly scientific written, communication. These are highly desirable skills in the workplace today. Scientific writing has its own guidelines and structure; the laboratory work (and report writing) in this class are practice in this art of "mind-writing". In addition, the opportunity to reinforce and apply what is learned in the 201 course should be welcomed by each of you. Learning physics is an iterative process, and the laboratory serves this end as it provides a grounding for the theoretical concepts learned in 201 lecture.

Intended Learning Outcomes

The following learning activities will serve as the foundation for the lab exercises: The successful student will:

1. explore open-ended questions that highlight course-related phenomena.
2. write clearly and insightfully about physical phenomena, graphical results, and experimental error.
3. design experimental testing of hypotheses in part and/or in full to meet the laboratory purpose(s).
4. deepen their understanding of both systematic and random error, as applied to physical results.

Attendance Policy

Since a portion of your grade in 201 depends on the laboratory, *you must enroll in both the "lecture" and laboratory sections of 201.* The lab starting and ending times are firm, although it may sometimes be possible to complete the lab before the published ending time. You will be allowed *one* late entrance to the lab up to 15 minutes after the set starting time, i.e., <3:05. After the first 15 minutes, no one will be admitted without prerequisite authorization. Alternative arrangements (e.g., make-ups) will only be entertained as a result of a discussion with me *beforehand* or an emergency note (death, hospitalization, misdemeanor, etc.) *signed* by a governing official (medical doctor, parent, law enforcer, etc.).

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 students 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 students notebook. Individual lab submissions through Turnitin must be each students original work, except for shared data. Each student is to submit their own work when answering the pre-lab questions. The colleges academic integrity policies will be enforced.

Make-Up Labs

There is no scheduled make-up lab section. If you have a legitimate reason for missing a lab, it can be made up at a time determined by the instructor and you will receive full credit for submitted materials.

Pre-lab Assignments

The purpose of the pre-lab assignments is to introduce the material that will be investigated during the lab, therefore pre-lab assignments are due at the beginning of the lab session, and are graded out of 10 points. If turned in after the start of lab, due to computer problems opening the simulation or for other reasons, 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.

Grading

The lab grade will be composed of:

Lab reports 70%
Pre-labs 20%
Lab notebook 10%

A percentage breakdown of how the grade for each lab is determined can be found on the following page.

Lab Notebooks

Each student is to purchase and bring a bound notebook with graph paper pages to lab each week. 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. If you decide to re-record data for some reason, you should not erase the original data written, but should instead explain the reason for re-recording, and place the new data table underneath this explanation. 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. **The organization and clarity of your lab notebook at the end of the semester will determine the lab notebook component of your lab grade.**

Lab Reports

Clear written scientific communication will be emphasized in this course. Lab reports consist of four sections: Abstract (A), Introduction (I), Data and Results (R), and Discussion (D). During the semester, written assignments will include each of these sections alone, as well as full lab reports. The content of each new section will be reviewed before that an assignment with that section is required. Some of the assignments will be group submissions (a single assignment produced by the lab group and submitted by one of the group members), and some will be individual (in which each lab member submits his or her own report). Equations must be typed using the MS Word equation editor. Lab reports will be returned within one week of submission (at the latest), with the exception of the first lab report which will be returned by the second lab session. **Please see the schedule on the last page of the syllabus for due dates of each lab; most assignments are due the Tuesday following 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 10 points for each 24 hour period** beyond the due date/time. All group members will receive the same grade on the group reports. The individual grading rubric for various sections and the full lab reports can be found on the next page.

Grading Rubric for Full Labs

Section 1, Abstract: 15 points total
- Purpose (2 points)
- Brief procedure (1 point)
- Principal results (6 points)
- Error analysis (2 points)
- Validity of results/supports purpose (4 points)

Section 2, Introduction: 15 points total
- Statement of primary physics concepts in words (4 points)
- Principal equations (4 points)
- Definition of terms (3 points)
- Written summary of data taken and analysis performed (4 points)

Section 3, Data and Results: 15 points total
- Data Tables (1-2 points each)
- Graphs (0-5 points)*
- Sample Calculations (3 points)
- Definition of terms with units (2 points)
  - *If no graphs, these points will be reassigned

Section 4, Discussion: 15 points total
- Expansion/statement of primary physics concepts (5 points)
- Answers to questions (3 points)
- Statement of results (1 point)
- Error analysis (3 points)
- Validity of results/purpose supported (3 points)

[Formatting]: 4 points total
- Descriptive Title/name(s)/date (2 points)
- 1.5 Spacing (1 point)
- Reasonable margins and font size (1 point)

Additionally, reports will be graded for the 3 C's of Communication for a total of 36 points:
- Completeness: 12 points (3 points for each section)
- Conciseness: 12 points (3 points for each section)
- Clarity: 12 points (3 points for each section)

This grading rubric places an emphasis on good scientific writing. Specifically, this means that: (i) ideas must be expressed fully without excessive wordiness or repetition; (ii) each topic must be stated in a clear manner that does not create confusion for the reader; (iii) the different parts of the report are clearly connected and cohesive (e.g., the discussion ties together the ideas presented in the introduction and the abstract summarizes all important elements in the experiment).

Grading Rubric for Individual Lab Sections

Assignments of individual lab report sections (e.g. Abstract, Introduction, Discussion) will be graded on a scale of 0-100. The basic grading rubric will remain unchanged. The lab is graded first according to the presence or absence of key elements, however, because only one section is being graded, the point value for that section will increase from 15 to 60 points. Four points will still be given to formatting. The 3 C's of communication will remain a total of 36 points.

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. 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 four or five, and initially may select their group members. Students in each lab group will be reshuffled several times throughout the semester. The responsibilities within the group should rotate, so that each member learns how to use Excel, LoggerPro, and helps conduct the experiment. It is the responsibility of the group members to work at a pace that allows completion of the experiment and required in-class report before the posted ending time of the lab.

Week	Date	Laboratory Topic	Assignment
1	21-Jan	Course policies Density experiment	Data and Results (Group) Due: Jan. 26
2	28-Jan	Uniform 1-d motion	Data and Results (Individual) Due: Feb. 2
3	4-Feb	Projectile motion	Abstract (Group) Due: Feb. 9
4	11-Feb	Exam review	
5	18-Feb	Frictional forces	Abstract (Individual) Due: Feb. 23
6	25-Feb	Circular motion	Introduction (Group) Due: Mar. 1
7	3-Mar	Conservation of energy	Introduction (Individual) Due: Mar. 15
		NO LAB: SPRING BREAK	
9	17-Mar	Conservation of energy	Discussion (Group) Due: Mar. 22
10	24-Mar	No lab	--
11	31-Mar	Conservation of momentum	Discussion (Individual) Due: Apr. 5
12	7-Apr	Angular motion	Full lab report (Individual) Due: Apr. 19
14	14-Apr	Exam review	
15	21-Apr	Harmonic motion	Abstract (individual) Due: Apr. 26

Note: Assignment schedule may be subject to revision during the semester.