PHYS 201L Newtonian Mechanics Lab

Spring 2019

Location: Trex 273 **Time:** TTh 2:50 - 5:50 and 6:00 - 9:00

Instructor: Dr. Evan M. Aguirre **Email:** aguirre@roanoke.edu

Office Hours: Th 1:30-2:50, MWF 11:00 - 12:00, also by appointment **Office:** Trexler 266B

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.

Overview

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. 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

By the end of this course, successful students will be able to:

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

Attendance

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. 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.).

Grading

The lab grade will be composed of:

Lab Reports	70%	Pre-labs
20% Lab Notebook		10%

The grading scale is as follows: **A** 100-90, 90 < **B** < 80, 80 < **C** < 70, 70 < **D** < 60, **F** < 60. I will not be giving pluses and minuses. There will be no make-up labs during the semester.

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). 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. Each lab report is due at the start of the next week's lab. 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.

Pre-labs

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.

Lab Notebook

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.

Grading Rubric

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)*(If no graphs, these points will be reassigned.
- Sample Calculations (3 points)
- Definition of terms with units (2 points)

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)

Additionally, reports will be graded for the 3 Cs 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)

Formatting: Title, Name, Date (4 pts)

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).

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 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.