Physics 103 Laboratory
Fall 2009

Meeting: Trexler 273
Office: Trexler 161B
Instructor: Bonnie W. Price
Office Hours: MWF: 9:30-10:30 am;
Email: price@roanoke.edu
T: 1:00-2:00 pm
Office: Trexler 161B

Required Materials:
Lab handouts will be distributed by instructor and also posted on Blackboard. Pre-lab materials are available online through Blackboard and should be printed and completed before coming to lab. A bound lab notebook with graph paper pages is needed, as well as a 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 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 103 grade (15%) depends on the laboratory, you must enroll in both the “lecture” and laboratory sections of 103. Furthermore, you may only attend the lab section for which you are registered, unless you have explicit permission from the instructor. 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 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 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 table format in each student’s notebook. Weekly abstracts are to be a collaborative effort within each lab group, with individual members rotating the responsibility of submitting the abstract electronically. The student submitting the abstract for the group will also submit a copy of the data, results, error analysis and calculations from their lab notebook, before leaving lab.

The one formal lab report and the final lab exam are to be each student’s original work with no sharing of information (except for the lab data). The college’s academic integrity policies will be enforced.
Grading:

- Completed lab notebook and attendance: 10%
- Prelabs: 10%
- Weekly lab submissions: 60%
- Formal Lab Report: 10%
- Lab Final Exam: 10%

Pre-lab assignments are due at the beginning of the lab and are worth 10 points. If completed at the end of the lab, due to computer problems opening the simulation or for other reasons, the maximum number of points possible decreases to 5. Any pre-lab assignment submitted after the ending time for the lab will receive 0 points.

**Before any member of the lab group leaves lab**, the student responsible for submitting that week’s abstract will be selected, and the instructor notified. This responsibility will rotate within the lab group. That person will also have their lab notebook photocopied by the instructor before leaving lab, so that a copy of the data, results, error analysis and sample calculations will be submitted. The lab notebook entries should be legible and well organized, and will be graded as follows:

- Names of each group member (5 points)
- Title of Experiment (5 points)
- Today’s Date (5 points)
- All Data, submitted in chart form, with correct units (15 points)
- All Results, including error analysis, submitted in chart form, with correct units (15 points)
- All Graphs, correctly titled and labeled, with trendline, equation and $R^2$ value stated (10 points)
- Sample calculation(s) (10 points)
- Legible and Organized (5 points)
- Abstract (30 points) -- To Be Submitted by Friday of each Lab Week

The group may have time to type an abstract before leaving lab, but it is the responsibility of one member to make sure that an abstract is sent to the instructor by email before **NOON ON FRIDAY** of the same week. Late submissions will have 10 points deducted for every 24 hours the abstract is late, with no points being awarded after the 12:00 am the following Tuesday. Each student within the lab group will receive the same grade for the weekly report, and also receive any penalties, so it is important that the lab notebook is completed accurately and thoroughly, and the abstract is well written and on time.

The abstract should include the following:
- A brief purpose, as it pertains to data collection
- **No more than 1 or 2 sentences** stating the method used to collect data
- No data
- Principal results with errors
- Explanation of errors -- **Be aware that human error is not an acceptable explanation for any disagreement with the intended results!**
- Answers to questions at the end of the lab handout
- A statement of agreement/disagreement with the intended purpose

On November 10, 2009, a written report will be due from each student. In this paper, a previous experiment is to be selected by the student (with the exception of Experiment #1 and #5) and a thorough discussion of the effect of friction on that experiment is to be presented. This report will also include a brief purpose and procedure, data collected during the experiment, results/graphs
originally presented, and new results/graphs presented to illustrate the effect of friction in the experiment, discussion, and conclusion.

A lab exam will be given during the last scheduled lab time. This written exam will contain questions from each of the labs. Each individual will submit their own work on the exam, but may use their class notes, textbook, lab handouts, and lab notebook to answer the questions. No sharing of information will be allowed, and no Internet use.

**Electronic Devices Usage Policy:**
Computers in the lab are networked and you are required to log onto them with your username and password. Printing graphs will be necessary throughout the semester and pages printed are counted in your total pages allotted by the college. Therefore, the group should rotate the responsibility of logging onto the system to share the cost of printing. **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.

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<thead>
<tr>
<th>Week Beginning</th>
<th>Lab Topic</th>
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<tr>
<td>August 31</td>
<td>Introduction: Dimensional Analysis and Units</td>
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<tr>
<td>September 7</td>
<td>Uniform Motion</td>
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<td>September 14</td>
<td>Uniform Acceleration</td>
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<td>September 21</td>
<td>Projectile Motion</td>
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<td>September 28</td>
<td>Force and Equilibrium</td>
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<td>October 5</td>
<td>Work and Energy</td>
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<td>October 12</td>
<td>No Lab—Fall Break</td>
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<td>October 19</td>
<td>Energy and Momentum Conservation</td>
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<td>October 26</td>
<td>Rotational Kinematics</td>
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<td>November 2</td>
<td>Energy and Momentum in Rotational Motion</td>
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<td>November 9</td>
<td>Fluid Static and Dynamics—Written Report Due</td>
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<td>November 16</td>
<td>Periodic and Simple Harmonic Motion</td>
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<td>November 23</td>
<td>No Lab—Thanksgiving Break</td>
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<td>November 30</td>
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