

# Phys 151R – 1201: General Physics Lab

## Spring 2012

### Syllabus

#### General Information

Instructor: Sameer Regmi

Email: sameer@regmi.net

Office: Leifson Physics Building 110

Office hours: Monday 4:00PM- 5:00PM

TA Mail box: Leifson Physics Building (Second Floor)

**Lab meeting time: Tuesday 01:00PM – 02:50PM**

**Room: DMS 208, 210, or 212**

**Lab manuals webpage: <http://physics.unr.edu/LabsSpring.html>**

#### Class Description and Objectives

The purpose of the physics laboratory is to allow students to witness the concepts and physical laws that are introduced in lecture. You will also be exposed to elementary laboratory techniques. Every class will have a short lecture introducing the procedures, concepts, formulas and instructions relevant to the experiment. The lecture will also cover what is expected from you and how to write-up your lab-report. Attendance and participation is expected. Experiments will be performed **in groups** of two or more students.

#### Course Requirements

##### *Lab etiquette*

- Please **don't be late**.
- No **FOOD/DRINKS/SMOKING/APPLYING** of COSMETICS in the labs.
- Please turn off your cell phone.
- You and your partners **must clean up and shut off equipment** after you are finished with your lab. Failing to do so can affect your grade.
- Please report all damaged equipment so it can be replaced.
- You are expected to **read the lab experiments** before class and have a **printed copy** of the lab with you in the class.

##### *Lab notebook*

- A lab notebook is the way real scientists keep track of their work. It may seem tedious or even unnecessary to you, but it is an important part of any lab experience. The notebook should be complete enough that you could refer back to it in a few years and repeat the experiments.
- Each student should maintain her/his own lab notebook.
- The notebook must be **permanently bound**: no loose-leaf or spiral notebooks.
- Handwriting must be legible. All notes should be taken in pen with the exception of colored drawings that may be done with pencils. Errors should be crossed through with a single line, not erased or obliterated.
- All information in the notebook must be **handwritten** or represent actual results, such as photographs. Do not place any photocopied material into your notebook unless specifically directed to do so.

- Everything you do in the laboratory should be recorded in your lab notebooks, including notes, drawings, data, speculations, etc. Everything from your initial strategy through planning, execution and interpretation and should be in your notebook.
- Keep all of your lab-related notes, including lab lecture notes, in one notebook. Keep a separate binder for the lab manual and lab handouts.
- Keep in mind that **lab reports will be prepared from the notebook**. You should have much more information recorded in your notebook than you can or should put on a report.
- The notebook for this course should include:
  - Notes from the lab lecture, especially those pertaining to the theory section of your report
  - Any corrections to or hints about the lab procedure
  - **Data you recorded from the lab** (you will be responsible to get your **individual data in your lab notebook signed** by the instructor before leaving the lab. *This signature will be counted as attendance.*)
  - Any other useful stuff for writing your report, like calculations or rough figures

### *Lab reports*

- There will be 11 lab experiments during the semester. **Only 10** of the 11 labs will be graded allowing the student to drop their lowest grade.
- Lab reports are due the following class period at the beginning of each class.
- **Each pair of students will turn in a single report.**
- A lab report which is one day late will have its grade docked 20%. The grade will be docked an additional 10% for each week the lab report is late.
- Lab reports that contain copied or plagiarized material will be given a zero.
- **Lab reports for labs the student did not perform will be given a zero.**
- **Typewritten** lab reports are preferred. **Neatly hand-written** lab reports are also accepted. Illegible lab reports are unacceptable.
- You can turn in graphs on graph paper or printed out. Hand-drawn graphs on anything other than graph papers are unacceptable.
- Please **follow the given format** for the lab write-ups.

### *Attendance*

- You are required to attend all the classes.
- If you must miss a lab due to an excused absence (illness, emergency or pre-arranged absence), you should arrange to make up the lab during a different lab session that week (the week of your absence). You should contact both instructors before attending another lab section.
- No more than two labs can be done in other lab sections.
- By department rules, **if you miss three or more classes you will receive a failing grade** for the lab section. There is no way to make up the labs.
- Lab reports that are turned in for experiments **which you did not attend/perform will not be graded**. You are expected to be to class on time.

### **Laboratory safety**

- Experimental work can expose one to various kinds of **hazards** (electric shock, burns, cuts...). Every person working in the laboratory should be situational **aware of their surroundings** so as to avoid possible injury.
- Be aware and reduce the risk of injury and/or damaging the equipment. Report any accident immediately.

### **Grading:**

- **Grading** will be based primarily on your lab reports.
- Also, at the end of semester your lab notebook will be examined to see if it has been maintained. **Lack of record** of any experiment in your lab notebook will lead to deduction of points (**up to 25 percent**) for that experiment. More importantly, **lack of signed original data** constitutes grounds for a **grade of zero**.
- **Only 10** of the 11 labs will be graded allowing the student to drop their lowest grade.
- By department rules, **if you miss three or more classes you will receive a failing grade**
- Each lab report worth **50 points**, and therefore the maximum total points possible is 500.
- A final percentage will be calculated by dividing the total points earned by 500.
- The final percentage will be reported to the Dr. Melodi Rodrigue.

### **Schedule:**

Feb 7	DMS 208	Orientation, Format of Lab Reports, Accuracy of Measurement
Feb 14	DMS 208	Force Table
Feb 21	DMS 212	Understanding Motion I and II, Freefall (photogate)
Feb 28	DMS 208	Equilibrium of Non-concurrent Forces
Mar 6	DMS 212	Conservation of Momentum
Mar 13	DMS 210	Uniform Circular Motion
Mar 27	DMS 208	Archimedes' Principle
Apr 3	DMS 210	Gas Law
Apr 10	DMS 210	Heat of Fusion
Apr 17	DMS 210	Linear Harmonic Motion
Apr 24	DMS 212	Standing Wave in Air and Strings

**Disability Services:** Any student wishing to apply for academic accommodations or adjustments is requested to inform the instructor, or contact the Disability Resource Center (DRC, Thompson, Suite 101, phone 784-6000) directly, as soon as possible to arrange appropriate actions. The DRC will be able to answer any questions regarding accommodations or adjustments.

**Academic Success Services:** Your student fees cover usage of the Math Center (784-443 or [www.unr.edu/mathcenter](http://www.unr.edu/mathcenter)), Tutoring Center (784-6801 or [www.unr.edu/tutoring](http://www.unr.edu/tutoring)), and University Writing Center (784-6030 or [www.unr.edu/writing\\_center](http://www.unr.edu/writing_center)). These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign a responsible and successful student.

**Academic Integrity:** All lab reports, homework, or exams must be your own work. Any act of plagiarism (cheating, piracy, theft, etc.) or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated and penalties can include canceling a student's enrollment without a grade, giving an F for the course or for the assignment. For more details, see the UNR General Catalog.

## Format of Lab Reports and Grading

Your report is an exercise in learning how to make an argument in the language and formal structure of scientific inquiry. For emphasis, let me say it again: **your report is an argument**. Imagine you are trying to convince an interested but non-expert reader of a **logical connection** between your data, numerical results from your data, and the validity of a physical principal. In making your argument, use strong, clear assertions like: “Our data **confirmed** the theory that mass and acceleration are related to the applied force by Newton’s second law.” However, it is best not to claim your data “proved” the theory since all scientific claims are subject to the possibility of disproof.

You should have every section in the format represented in every lab report you hand in. It would be a good idea to make yourself a **lab report template** in software like MS Word to help guide you through each section and help you to not leave anything out. **Label each section** except the title page with its name (Abstract, Theory, etc.), and present the section **in the order given** here.

### Title Page (2 points):

**Title of the Experiment**

*Your Name*

*PHYS 151 Lab Section*

*Date of Experiment*

*Report’s due date*

### Abstract (5 points):

- A concise statement (a paragraph or two) that **summarizes** the objective.
- In **your own words** state the **(numerical) results** of the experiment.
- It is often best to write this section last, when you finally understand what you did.

### Theory (10 points):

- Usually the theory is given in the lab write-up. Rather than merely copying from this, it is much better to **summarize the theory** of the physics involved in **your own words**.
- Also present the **working equations, proper units, diagrams and schematic** of the experimental apparatus.
- This section should **define and explain relevant terms**, and also **outline the procedures** used in the lab.

### Data (7 points):

- A clear display of the raw data generated by the experimental process, **preferably in tabular form** should be presented.
- Make sure that all **entries are clearly identified**, including the **proper units**.

### Analysis (14 points/lab dependent):

- This section must clearly show the **computations** used to reduce the data.
- First write the **relevant equations** then give a **sample calculation** (if there are repetitive calculations), using numbers taken from the tabulation of your data.
- Be sure to include **proper units** and use the correct number of **significant figures**.

- Use power-of-ten (scientific notation) for large or small numbers ( $2.05 \times 10^{-4}$  rather than 0.000205).
- Use a separate line for each step--don't crowd everything together.
- For data presentation in the form of a **graph**, follow the instructions given in the orientation lab.

**Results and conclusion (12 points):**

- A brief **clear summary of your results** obtained from the calculations. State the **determined value** or law, along with its **numerical uncertainty**. Use proper units and significant figures.

- For example, the experimental value for “g” was found to be:

$$\text{Acceleration of gravity } g = (9.8 \pm 0.2) \text{ m/s}^2$$

- Frequently you will want to compare your result (F) with an accepted value ( $F_0$ ). A good quantity to compute in this case is the “percent discrepancy” or the “percent error” which is defined as:

$$\text{Percent - Discrepancy} = \frac{|F - F_0|}{F_0} \times 100\%$$

- If you are comparing two values of “F” found in different ways ( $F_1$  and  $F_2$ ) find the “percent difference” given by:

$$\text{Percent - Difference} = \frac{|F_1 - F_2|}{F_M} \times 100\%$$

Where  $F_M$  is the mean of  $F_1$  and  $F_2$ .

- Round off percent errors and differences to two significant figures.
- **Discuss what you found** and compare with what you had expected to find. Discuss any discrepancies.
- Describe several sources of experimental error and suggest ways in which to improve the experiment or reduce errors.
- Some labs may include **questions** which should be answered.

**Note:** Your instructor will consider the above format important when grading your lab report. The following will also be considered important in grading your reports:

1. Neatness
2. Composition
3. Grammar
4. Thought/Originality in presentation
5. Spelling

Bonus point will be given for finding and reporting errors in lab manual.

Some labs may not conform exactly to the lab report format, given above. Some may not require a certain section of the lab format while another lab may require an additional section be added to the write-up. For nonconforming labs, check with the instructor as to what they expect for a write up.