

PHYSICS 211L
ESSENTIALS OF PHYSICS LAB I

BULLETIN INFORMATION

PHYS 211L - Essentials of Physics I Lab (1 credit hour)

Course Description: Corequisite: Prereq or coreq: PHYS 206, or PHYS 211

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SAMPLE COURSE OVERVIEW

In PHYS 211L, the semester is divided into four blocks of time, called *cycles*. Each cycle is (for Summer Sessions one week long) three weeks long. During each cycle, two projects will be performed by each laboratory group. A lab group will work on their first project during day one. Before they leave, each group will have their lab notebooks graded by the TA. This grade will serve as the preliminary lab report grade. The questions that are in the project description will not be included in this grade. The second day of the cycle will be spent working on the project on the opposite side of the lab room, same row, as the first project. A preliminary lab report grade will be given by the TA for this project just as in day one. Day three will be used for oral presentations. Each student will give one oral presentation during the semester. For each cycle, every student will turn in two final lab reports, and a set of *Presentation Critiques*.

ITEMIZED LEARNING OUTCOMES

Upon successful completion of Physics 211L, students will be able to:

1. Perform a careful experiment, estimate the uncertainties, and present the results graphically.
2. Demonstrate use of the graph as an analysis tool. In particular, they should understand methods for finding the straight line and the uncertainties best representing the data.
3. Prepare technical material for oral presentation to a group of peers.
4. Demonstrate the ability to make connections among the concepts taught in the lecture portion of the course, experiences from the 'real world', and the laboratory exercises.
5. Explain how the scientific method is used in the context of taking experimental data and using that data to support, or disprove a scientific hypothesis.
6. Explain concepts and principles involved in the labs, e.g.:
 - a. The force laws, friction, and motion
 - b. Conservation of energy and momentum
 - c. Torque and rotational motion
 - d. Some properties of materials involving buoyancy and sound
 - e.

SAMPLE REQUIRED TEXTS/SUGGESTED READINGS/MATERIALS

TBA

SAMPLE ASSIGNMENTS AND/OR EXAM

1. Eight preliminary lab reports
2. Eight final lab reports
3. Four sets of oral report critiques
4. One oral presentation
5. Class participation

SAMPLE COURSE OUTLINE WITH TIMELINE OF TOPICS, READINGS/ASSIGNMENTS, EXAMS/PROJECTS

Collected here are the links to the assigned laboratory projects for the current semester. To find your projects, first locate the table for your course. The projects assigned to you are determined by the side of the room on which you sit in lab. The project on that side is the one you will perform in the first week of the corresponding cycle. In the second week of the same cycle, you move across the aisle and perform the other project. The sides of the room are referred to by their compass direction (i.e. North and South). *HINT: You can see the sunset through the lab windows.*

Physics 211 Laboratory Projects

	<u>North</u>	<u>South</u>
Cycle 1	Acceleration of Gravity (Falling) Freefall (5)	Force Table (5) Force Table Video
Cycle 2	Simple Pendulum (3) OR Sliding Block (2)	Newtons 2nd Law (3) OR Projectile Motion (2)
Cycle 3	Linear Momentum-2 (3) OR Archimedes (2)	Uniform Circular Motion (5)
Cycle 4	Vibrating String (5)	Rotational Motion With Constant Torque (3) OR Speed of Sound (2)

Objectives for Physics 211L Laboratory Projects

1. **Free Fall:** To compare two methods of measuring the acceleration due to gravity on the Earth's surface.
2. **Simple Pendulum:** To understand the relationship between the period and the length of a simple pendulum.

3. **Projectile Motion:** To determine the initial velocity of a projectile by a measurement of its range and compare it to the velocity measured by timing the ball crossing a known distance. The dependence of the range on the firing angle is explored.
4. **Linear Momentum:** To measure momentum before and after collisions as a way of investigating momentum conservation.
5. **Archimedes:** To determine the densities of irregularly shaped objects using Archimedes' Principle.
6. **Vibrating String:** To study standing waves on a vibrating string and verify the relationship between frequency, tension, wavelength, speed.
7. **Force Table:** To study vector addition by comparing the results of the experimental addition of several forces with the results of graphical constructions.
8. **Newton's Second Law:** To investigate the relationship between the acceleration of objects of different mass.
9. **Sliding Block:** To determine the coefficient of friction for a friction cart as a function of its mass and compare it with a known value. The difference between static and kinetic friction will also be examined.
10. **Uniform Circular Motion:** To use the relationship between force and acceleration in uniform circular motion to determine the mass of an object.
11. **Rotational Motion with Constant Torque:** To measure the moment of inertia of a system using Newton's Second Law in rotational form and compare with a theoretical calculation.
12. **Speed of Sound:** To determine the speed of sound in air by means of a resonating air column at room temperature.