Las Positas College
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Course Outline for PHYS 10L

DESCRIPTIVE PHYSICS LAB

Effective: Spring 2009

I. CATALOG DESCRIPTION:
PHYS 10L — DESCRIPTIVE PHYSICS LAB — 1.00 units

Introduction to laboratory principles and techniques with emphasis on the basic concepts of physics such as mechanics, thermodynamics, energy, electricity, magnetism, and optics.

1.00 Units Lab

Prerequisite
PHYS 10 - Descriptive Physics

Strongly Recommended
MATH 107 - Pre-Algebra

Grading Methods:
Letter Grade

Discipline:

	MIN
Lab Hours:	54.00
Total Hours:	54.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. PHYS10

Before entering this course, it is strongly recommended that the student should be able to:

A. MATH107

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Perform laboratory measurements using simple tools;
B. Measure quantities such as acceleration, force, momentum, energy, voltage, current, resistance, temperature, and intensity and be able to correctly apply them in relevant physical contexts.
C. Measure thermodynamic quantities such as specific heat, thermal conductivity, and thermal expansion coefficients and be able to correctly apply them in relevant physical contexts.
D. Define and measure electromagnetic quantities such as current, voltage, power, and magnetic field strength and be able to correctly apply them in relevant physical contexts.
E. Manipulate lenses, build simple optical lens systems, and demonstrate understanding of the operating principles underlying basic optical equipment.
F. Operate standard laboratory equipment, including computer based data acquisition systems, such as:
    1. Simple and physical pendulums
    2. Mass and Spring systems
    3. Stopwatches, rulers, protractors
    4. Universal Laboratory Interface (ULI) and/or LabPro data collection interface
    5. Logger Pro (computer-based data acquisition program by Vernier)
    6. Motion Detector
    7. Photogate
    8. Air Track
    9. Projectile Apparatus
    10. Vernier Calipers and Micrometers
    11. Multi-meters and Oscilloscopes
    12. Power Supplies
    13. Function Generators
G. Analyze and present laboratory data using, as necessary, computer- and calculator-based analytic, spreadsheet and graphing

applications such as:
1. Graphical Analysis (computer-based data analysis program by Vernier)
2. MS Excel
3. MS Word

H. Work with Interactive Computer based simulations of physics experiments, and demonstrate understanding of the results.
I. Write comprehensive laboratory reports, including the following sections:
J. Introduction
1. Data
2. Data Analysis:
3. Sample Calculations
4. Graphs and Charts
5. Conclusion/Summary

V. CONTENT:
A. Physics and Measurement. Standards of length, mass, and time. Dimensional analysis. Uncertainty in measurements and significant figures. Conversion of units. Order-of-Magnitude calculations. Coordinate systems.
B. Principles of laboratory safety and use of laboratory equipment.
C. Motion in one dimension. Measurement of constant and instantaneous speed, velocity, and acceleration. Free fall and projectile motion.
D. Measurement of mass and weight. Relationships between force, mass, and acceleration. Applications of Newton's laws in understanding the behavior of objects in the laboratory.
E. Demonstration, study, and measurement of energy, momentum, and angular momentum conservation.
F. Heat, Kinetic Theory, and Entropy. Behavior of gasses. Relationships between temperature, pressure, and volume. Relationship between temperature and kinetic energy. Principles of heat transport. Applications of thermal principles to familiar problems in heating and insulation. The three laws of thermodynamics. Relationship between heat, temperature, and disorder.
G. Wave Motion: Sound waves, interference, musical sounds, harmonics, and resonance.
H. Electricity and Magnetism: Electric forces and fields, magnetic forces and fields. Electric potential. Direct and alternating current circuits. Electromagnetic Induction.
I. Optics, lenses, and simple telescopes. Demonstration and measurement of properties of lenses and lens systems such as index of refraction, magnification, and focal length. Electromagnetic waves
J. Modern physics including relativity, quantum, nuclear, and particle physics

VI. METHODS OF INSTRUCTION:
A. **Demonstration** - and Computer-based simulations
B. **Lab** -
C. Individual and group skill building activities (may include problem worksheets, hands-on experimentation, movies, and/or computer simulations)

VII. TYPICAL ASSIGNMENTS:
A. Laboratory reports (individual and group), including computer-based data acquisition and analysis 1. Acceleration in One Dimension: In this lab you will use an ultrasonic motion detector with a computer interface to measure the position of a moving cart as a function of time. In Part A of this experiment, you will measure the velocity of the cart on a level track, with no acceleration. In Part B, you will angle the track so that gravity accelerates the cart. 2. Magnetic Force on Current Carrying Wires: In this laboratory, you will explore the magnetic force on a current-carrying wire, and how that force varies with current, length of wire, strength of magnetic field, and angle collisions B. Special exercise worksheets, problem review, and computer simulations and tutorials 1. Web assignment: Cannon Applet. See Website listed in laboratory schedule. Complete sections (a) through (f) from Projectile Motion Laboratory instructions and turn in with laboratory report for lab Projectile Motion. 2. Web assignment: Motion of a Charged Particle in a Magnetic Field. See Website listed in laboratory schedule. Complete sections (a) through (c) and turn in with report for laboratory Tangent Galvanometer

VIII. EVALUATION:
A. **Methods**

1. Exams/Tests
2. Lab Activities

B. **Frequency**

1. Frequency
    a. Weekly or Bi-weekly use of discussion area as a learning/interaction tool
    b. Weekly laboratory reports

IX. TYPICAL TEXTS:
1. Hewitt, Paul; Robinson, Paul. *Laboratory Manual: Conceptual Physics.* 9th ed., Addison Wesley, 2002.
2. Las Positas College Staff *Laboratory Manual for Physics 10L,* ., Las Positas College, , 2008.

X. OTHER MATERIALS REQUIRED OF STUDENTS:
A. Calculator
B. Computer and Internet Access
C. Inexpensive Hardware for basic physics investigations including string, timepieces, rulers, and protractors.