### Syllabus for PHY 101—General Physics I Laboratory 1 Credit Hour Fall 2009

#### I. COURSE DESCRIPTION

Lab exercises to supplement PHY 101 Lecture. Corequisite: PHY 101 Lecture. Lab fee: \$35.

General Physics I laboratory provides practical hands-on experiments in beginning physics. The topics included are mechanics, heat, and sound. The experiments that are done in this laboratory course complement the topics under discussion in the co requisite lecture course PHY 101.

#### II. COURSE GOALS

This course is designed to enable the student to do the following:

- A. Gain practical experience for the concepts discussed in the General Physics I Lecture course.
- B. Obtain an understanding of experimental techniques generally applicable to research in physical sciences.

#### III. STUDENT LEARNING OUTCOMES FOR THIS COURSE

A. Terminal Objectives

As a result of successfully completing this course, the student will be able to do the following:

- 1. Set up and correctly use the apparatus encountered during the course.
- 2. Identify apparatus and measurements with the physical concepts with which they deal.
- 3. Correctly execute appropriate systematic and mathematical analysis of problems similar to those encountered during the course.
- 4. Discuss the sources and magnitude of errors inherent in the measurements utilized during the course.
- B. Unit Objectives

As a result of successfully completing the following units, the student will be able to do the following:

- 1. Experimental Uncertainty and Data Analysis
  - a. Distinguish between precision and accuracy.
  - b. Explain about various types of errors.
  - c. Properly present data and results.

- 2. Mass, Volume and Density
  - a. Perform measurements using the vernier calipers, the micrometer calipers, and the triple-beam balance.
  - b. Measure the density of several materials.
- 3. Acceleration of Gravity
  - a. Measure and record the location, velocity, and acceleration of an accelerated object.
  - b. Calculate the acceleration of gravity and to inductively prove it is a constant.
- 4. Vectors
  - a. Resolve and add vectors using graphs and using trigonometry.
  - b. Add vectors for forces in equilibrium using a force table.
- 5. Projectile Motion
  - a. Measure the horizontal distance for a given angle of projection.
  - b. Verify the equations of the projectile motion.
- 6. The Atwood Machine (computer assisted)
  - a. Measure the acceleration of a mass.
  - b. Relate acceleration to mass and net force.
- 7. Collisions (computer assisted)
  - a. Study conservation of momentum and conservation of kinetic energy for elastic collisions.
  - b. Study conservation of momentum for inelastic collisions.
- 8. Rotational Equilibrium
  - a. Measure the net force on an object in equilibrium.
  - b. Measure the net torque on an object in equilibrium.
- 9. Archimedes' Principle
  - a. Measure the buoyancy force on a solid submerged in a liquid.
  - b. Calculate the density of a solid and a liquid using this principle.
- 10. Standing Waves
  - a. Measure the frequency of a vibrating string.
  - b. Calculate the wave velocity in the string.
- 11. Resonance
  - a. Measure resonance length of the air columns.
  - b. Calculate the velocity of sound in air.
- 12. Specific Heat and the Latent Heat of Fusion
  - a. Determine the specific heat of a metal.
  - b. Measure the heat of fusion of ice.

#### IV. TEXTBOOKS AND OTHER LEARNING RESOURCES

A. Required Materials

Textbooks

Wilson, Jerry D. <u>Physics Laboratory Experiments</u>, 6th ed. Boston: Houghton Mifflin Company, 2005. Raymond A. Serway, Jerry S. Faughn, Chris Vuille, Charles A. Bennet, "College Physics", 7-th edition, Thomson Brooke/Cole, Belmont, CA 2006.

B. Other Required Materials Scientific Calculator

## V. POLICIES AND PROCEDURES

#### A. University Policies and Procedures

- 1. Attendance at each class or laboratory is mandatory at Oral Roberts University. Excessive absences can reduce a student's grade or deny credit for the course. I will circulate an attendance sheet at the beginning of each class session.
- 2. Students taking a late exam because of an unauthorized absence are charged a late exam fee.
- 3. Students and faculty at Oral Roberts University must adhere to all laws addressing the ethical use of others' materials, whether it is in the form of print, video, multimedia, or computer software. By submitting an assignment in any form, the student gives permission for the assignment to be checked for plagiarism, either by submitting the work for electronic verification or by other means.
- 4. Final exams cannot be given before their scheduled times. Students need to check the final exam schedule before planning return flights or other events at the end of the semester.
- 5. Students are to be in compliance with University, school, and departmental policies regarding Whole Person Assessment. Students should consult the WPA handbooks for requirements regarding general education and the students' majors.
  - a. The penalty for not submitting electronically or for incorrectly submitting an eportfolio artifact is a zero for that assignment.
  - b. By submitting an assignment, the student gives permission for the `assignment to be assessed electronically.
- B. Course Policies and Procedures

1.

- **Evaluation Procedures** 
  - a. The laboratory manual for this course contains procedural instructions, theoretical explanations, and relevant questions for each experiment. Results from the procedures and answers to the questions will be written in the designated areas within the manual. Then a discussion or conclusion of the experiment should be written on a separate sheet of paper and attached to the report. The conclusion should concise and to the point, not over half a page.
  - b. Students will have three hours in the laboratory to complete each day's experiment, and must hand in their written report at the end of the period, whenever possible.
  - c. Each student is expected to read the experiment before the lab period and complete the Advance Study Assignment that precedes each experiment which will be collected at the beginning of the laboratory period.

0 0	<b>2</b> I	
12 lab write-ups (25 pts each)	=	300 pts
Lab final (written and/or practical)	=	200 pts
3 quizzes (50 pts each)	=	150 pts

Total = 650 pts

- d. The letter grade is assigned in accordance with the following percentage ranges:
  - A = 100 90
  - B = 89 80
  - C = 79 70
  - D = 69 60
  - F = 59-0
- 2. Whole Person Assessment
  - a. In conjunction with laboratory #2, Acceleration of Gravity, a special assessment of the results of the exercise is required to be submitted as a Whole Person Assessment.
  - b. Instructions for completing this assignment will be handed out in lab. They are also available on the eli website under the category "Whole Person Assessment" as part of the General Education Handbook.
- 3. Other Policies and/or Procedures
  - a. Students are responsible for the University materials that they use during the laboratory period and will be assessed an appropriate fee for any items that are lost, damaged, or broken.
  - b. Students should leave their table and apparatus in good order; i.e., weights put away, instruments returned, scrap paper picked up, etc.
  - Make-up assignments (for full credit) are given only in extremely unavoidable situations upon PRIOR ARRANGMENT WITH INSTRUCTOR or with valid medical excuse; otherwise missed assignment will be graded with 25% penalty.
    Show all work for the full credit.
    Messy papers (non-trimmed, non-stapled, non-readable) will result in a

Messy papers (non-trimmed, non-stapled, non-readable) will result in a lower grade.

Late work will be assessed 20% per week penalty.

d. Courtesy

Please, turn off your cell phones.

No food in the classroom without valid medical reason.

e. Instructor may change the assignment schedule at any time by verbal or written notification to the class.

### VI. COURSE CALENDAR

Lab. No.

Lab

- 1 Mass, Volume, and Density. Experiment 2
- 2 Uniformly Accelerated Motion Free Fall. Handout
- 3 The Addition and Resolution of Vectors. Experiment 4
- 4 Atwood Machine and Smart Pulley (computer assisted). Handout
- 5. Conservation of linear momentum, Collisions (Computer Assisted) Handout

### Quiz 1 over Labs 1-4

- 6 Torques, Equilibrium and Center of Gravity. Experiment 11
- 7. Archimedes' Principle. Handout
- 8. Specific Heat of Metals. Experiment 15

## Fall Break

- 9. Heats of Fusion and Vaporization of Water. Handout **Quiz 2 over Labs 5-8**
- 10. Simple Harmonic Motion. Experiment 12
- 11. Standing Waves in a String Experiment 13
- 12 Air Column Resonance: The Speed of Sound in Air. Handout
- 13 Make-up, Review. Quiz over Labs 9-12
- 14 Thanksgiving Week No Lab
- 15 Final

# **Course Inventory for ORU's Student Learning Outcomes**

## PHY 101-General Physics I Lab Fall 2009

This course contributes to the ORU student learning outcomes as indicated below: Significant Contribution – Addresses the outcome directly and includes targeted assessment. Moderate Contribution – Addresses the outcome directly or indirectly and includes some assessment. Minimal Contribution – Addresses the outcome indirectly and includes little or no assessment. No Contribution – Does not address the outcome.

The Student Learning Glossary at <u>http://ir.oru.edu/doc/glossary.pdf</u> defines each outcome and each of the proficiencies/capacities.

<b>OUTCOMES &amp; Proficiencies/Capacities</b>	Significant	Moderate	Minimal	No
	Contribution	Contribution	Contribution	Contribution

1	Outcome #1 – Spiritually Alive			
	Proficiencies/Capacities			
1A	Biblical knowledge		$\checkmark$	
1B	Sensitivity to the Holy Spirit			
1C	Evangelistic capability			$\checkmark$
1D	Ethical behavior			

2	Outcome #2 – Intellectually Alert			
	Proficiencies/Capacities			
2A	Critical thinking	$\checkmark$		
2B	Information literacy		$\checkmark$	
2C	Global & historical perspectives		$\checkmark$	
2D	Aesthetic appreciation		$\checkmark$	
2E	Intellectual creativity		$\overline{\mathbf{v}}$	

3	Outcome #3 – Physically Disciplined Proficiencies/Capacities			
3A	Healthy lifestyle		$\checkmark$	
3B	Physically disciplined lifestyle		$\checkmark$	

4	Outcome #4 – Socially Adept			
4A	Communication skills			
4B	Interpersonal skills		√ √	
4C	Appreciation of cultural & linguistic differences			$\checkmark$
4D	Responsible citizenship		$\checkmark$	
4E	Leadership capacity		$\checkmark$	