Syllabus for
**PHY 101 General Physics I Laboratory**
1 Credit Hour
Fall 2017

I. COURSE DESCRIPTION

Lab exercises to supplement PHY 101 Lecture.
Corequisite: PHY 101 Lecture.
Lab fee: $75.

II. COURSE GOALS

The purpose of this course is 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.

C. Participate in practical hands-on experiments in beginning physics; the topics included are mechanics, heat, and sound. The experiments that are done in this lab course complement the topics under discussion in the corequisite lecture course PHY 101.

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
   1. Textbooks
      Wilson, Jerry D. *Physics Laboratory Experiments*. 7th ed. Boston: Brooks/Cole, 2010. ISBN-13: 978054722748
   2. Other
      Scientific calculator

B. Optional Materials
   1. Textbooks
      None
   2. Other
      None

## 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 late exams because of unauthorized absence are charged a ($15) 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, electronic, video, multimedia, or computer software. Plagiarism and other forms of cheating involve both lying and stealing and are violations of ORU's Honor Code: "I will not cheat or plagiarize; I will do my own academic work and will not inappropriately collaborate with other students on assignments." Plagiarism is usually defined as copying someone else's ideas, words, or sentence structure and submitting them as one's own. Other forms of academic dishonesty include (but are not limited to) the following:
   a. Submitting another's work as one's own or colluding with someone else and submitting that work as though it were his or hers;
   b. Failing to meet group assignment or project requirements while claiming to have done so;
   c. Failing to cite sources used in a paper;
   d. Creating results for experiments, observations, interviews, or projects that were not done;
   e. Receiving or giving unauthorized help on assignments.

   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. Penalties for any of the above infractions may result in disciplinary action including failing the assignment or failing the course or expulsion from the University, as determined by department and University guidelines.
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 the Whole Person Assessment requirements. Students should consult the Whole Person Assessment handbooks for requirements regarding general education and the students' majors.
   a. The penalty for not submitting electronically or for incorrectly submitting an artifact is a zero for that assignment.
   b. By submitting an assignment, the student gives permission for the ` assignment to be assessed electronically.

### B. Department Policies and Procedures

1. A fee of $15.00 is assessed for all late exams. The university's late exam policy applies to all exams taken without notifying the professor prior to the regularly scheduled exam time and to all exams taken late without an administrative excuse.
2. Any student whose unexcused absences total 33% or more of the total number of class sessions receives an F for the course grade.

C. Course Policies and Procedures

1. Evaluation Procedures

a. 12 lab write-ups (25 pts. each) 45%.
Lab final (written and/or practical) 30%
3 quizzes (50 pts. each) 25%
Total 100%

b. The letter grade is assigned in accordance with the following percentage ranges:
A=90%
B=80%
C=70%
D=60%
F=59% and below

2. Whole Person Assessment Requirements

a. In conjunction with lab #2, Acceleration of Gravity, a special assessment of the results of the exercise is required to be submitted as a WPA artifact.

b. Instructions for completing this assignment will be handed out in lab. They are also available on the Eli Web site under the category "Whole Person Assessment" as part of the General Education Handbook.

3. Other Policies and/or Procedures

a. The lab 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 be concise and to the point, not over half a page.

b. Students will have three hours in the lab 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.

d. Students are responsible for the University materials that they use during the lab period and will be assessed an appropriate fee for any items that are lost, damaged, or broken.

e. Students should leave their table and apparatus in good order (i.e., weights put away, instruments returned, scrap paper picked up, etc.)

f. 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.

g. Late work will be assessed 20% per week penalty.

h. Please, turn off your cell phones. No food in the classroom without valid medical reason. Show all work for the full credit. Messy papers (nontrimmed, nonstapled, and nonreadable) will result in a lower grade.

i. 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 5 |
| 4 | Atwood Machine and Smart Pulley (computer assisted)—Handout |
| 5 | Conservation of Linear Momentum—Experiment 7 |
| | **Quiz 1 over Labs 1-4** |
| 6 | Torques, Equilibrium, and Center of Gravity—Experiment 12 |
| 7 | Archimedes' Principle—Experiment 18 |
| 8 | Specific Heat of Metals—Experiment 17 |
| | **Fall Break** |
| 9 | Heats of Fusion and Vaporization of Water—Handout<br>**Quiz 2 over Labs 5-8** |
| 10 | Simple Harmonic Motion—Experiment 14 |
| 11 | Standing Waves in a String—Experiment 15 |
| 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** |

**Instructor: Dr. Elena Gregg, Engineering Department**
**Office GC 1 D 32, ext. 6253, egregg@oru.edu.**
**The department secretary, ext. 6531.**
**Lectures: LRC 113A/ Labs: GC 1A 20.**

**Course Inventory for ORU's Student Learning Outcomes**
**PHY 101—General Physics I Lab**
**Fall 2017**

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 http://ir.oru.edu/doc/glossary.pdf defines each outcome and each of the proficiencies/capacities.

| **OUTCOMES & Proficiencies/Capacities** | Significant Contribution | Moderate Contribution | Minimal Contribution | No Contribution |
|---|---|---|---|---|
| **1** | **Outcome #1 – Spiritually Alive** Proficiencies/Capacities | | | | |
| 1A | Biblical knowledge | | | X | |
| 1B | Sensitivity to the Holy Spirit | | | X | |
| 1C | Evangelistic capability | | | | X |
| 1D | Ethical behavior | | | X | |
| **2** | **Outcome #2 – Intellectually Alert** Proficiencies/Capacities | | | | |
| 2A | Critical thinking | X | | | |
| 2B | Information literacy | | | X | |
| 2C | Global & historical perspectives | | | X | |
| 2D | Aesthetic appreciation | | | X | |
| 2E | Intellectual creativity | | | X | |
| **3** | **Outcome #3 – Physically Disciplined** Proficiencies/Capacities | | | | |
| 3A | Healthy lifestyle | | | X | |
| 3B | Physically disciplined lifestyle | | | X | |
| **4** | **Outcome #4 – Socially Adept** Proficiencies/Capacities | | | | |
| 4A | Communication skills | | | X | |
| 4B | Interpersonal skills | | | X | |
| 4C | Appreciation of cultural & linguistic differences | | | | X |
| 4D | Responsible citizenship | | | X | |
| 4E | Leadership capacity | | | X | |