

## **Common Course Outline for: PHYS 1002 Energy, Climate, & Physics in Society Laboratory**

### **A. Course Description**

1. Number of credits: 1
2. Lecture hours per week: 0  
Lab hours per week: 2
3. Prerequisites: Physics 1101 (C or better) or concurrent enrollment
4. Co-requisites: None
5. MnTC Goals: The combination of PHYS 1001 and PHYS 1002 satisfies MnTC Goal 3 with Laboratory.

This is an optional laboratory course for students who are concurrently enrolled in PHYS 1001 or who have previously completed PHYS 1001 (with a C or better).

### **B. Date last revised:** January 2018

### **C. Outline of Major Content Areas**

1. Measurement and error
2. Light
3. Global Warming (greenhouse effect, carbon footprint, ocean acidification)
4. Thermal energy
5. Newton's Second Law and gravitational acceleration
6. Radiation Protection
7. Half-life, fission, and chain reactions
8. Electrostatics and batteries
9. Magnetic induction and motors
10. Waves

### **D. Course Learning Outcomes**

Upon successful completion of the course, the student will be able to:

1. Define standard vocabulary of data acquisition and analysis such as uncertainty, average, standard deviation, percent error, percent difference, etc.
2. Follow a laboratory procedure carefully and methodically, and understand the importance being meticulous during data acquisition.
3. Present data both numerically and graphically.
4. Identify sources of error (uncertainty) and how error affects experimental results.
5. Use Microsoft Excel to: create data tables; perform long calculations (such as average and standard deviation); perform repetitive calculations using a user-defined formula; create graphs; fit data with predefined functions.

6. Use Vernier Logger Pro to: collect data using sensors and a computer interface; graph data; fit data with predefined functions and with user-defined functions.
7. Express experimental results and interpretations orally, mathematically, visually, and in writing.
8. Demonstrate an understanding of all of the major content areas.

Upon successful completion of this course AND PHYS 1001, the student will be able to:

1. Demonstrate an appreciation of the value of a scientific perspective and how new knowledge changes our view of the world. (Goal 3 definition)
2. Demonstrate an understanding of how physics principles affect their lives and the impact they have on societal issues. (Goal 3 definition)
3. Demonstrate an understanding of physics principles. (3a)
4. Formulate hypotheses and test them by collecting data and analyzing it statistically and graphically. (3b)
5. Identify sources of error and estimating uncertainty in measurements and calculations. (3b)
6. Express their experimental results, analyses, and interpretations orally, mathematically, visually, and in writing. (3c)
7. Evaluate societal issues from a scientific perspective and make informed judgments on policies that have scientific underpinnings. (3d)

**E. Methods for Assessing Student Learning:** Assessment methods are at the discretion of the instructor and may include

1. Pre-lab assignments, either on paper or online.
2. Student “Check-ins” with the instructor during labs.
3. Written lab reports and/or worksheets.
4. Exams.
5. Peer evaluation of participation

**F. Special Information:**

1. A simple scientific calculator is required.
2. The department of physics/engineering has minimum attendance requirements for laboratories. There is some variation by instructor. Most commonly, missing more than three labs results in automatic failure of the course. Missing one to three labs will have a progressive impact on a student’s grade, as determined by instructor.
3. Beginning in Fall 2017, PHYS 1002, combined with PHYS 1001, meets the following Board of Teaching Standards: ELEM J2b, ELEM J2c, ELEM J2e, ELEM J3, ELEM J4, and ELEM J5. Both courses must be successfully completed to satisfy all of the standards listed. The table that follows indicates the course learning outcomes and course topics meet the BOT standards.

Board of Teaching Standard	PHYS 1001 Course Learning Outcomes	PHYS 1002 Course Learning Outcomes	Combined Course Learning Outcomes
ELEM J2B	1, 2, 3	1-5, 8	1, 4-6
ELEM J2C		1-8	4-6

ELEM J2E	1, 4		
ELEM J3	1, 4, 5		
ELEM J4	4, 5		
ELEM J5: Which course contains each topic is indicated below	1	1	
	Properties of and changes in matter	Position, Motion	
	Force	Force	
	Light	Electricity and Magnetism	
	Heat		
	Kinds of, and ways to transfer, energy		