

LAST REVIEW: 2010-2011
(i.e. 2006-2007)

NEXT REVIEW: 2015-2016
(i.e. 2011-2012)

STATUS: A
(A, I, D)

COURSE TITLE: General Physics I

COMMON COURSE NUMBER: PHY2053

CREDIT HOURS: 3

CONTACT HOUR BREAKDOWN

(Per 16 week term)

CLOCK HOURS:
(Voc. Course ONLY)

Lecture: **48** Lab:
Clinic: Other:

PREREQUISITE(S): MAC1105 with a minimum grade of C

COREQUISITE(S): MAC1114 and PHY2053L

PRE/COREQUISITE(S):

COURSE DESCRIPTION *(750 characters, maximum):*

PHY2053 is the first course in a two semester sequence outlining mechanics, properties of matter, heat and sound. Algebra, trigonometry, geometry and vector methods will be used in the quantitative description of these topics.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): 4B Area
General Education Requirements – Associate in Science Degree (AS), meets Area(s): 4B Area
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area

UNIT TITLES

- 1. Measurement and Vectors and Problem Solving**
- 2. Mechanics**
- 3. Energy and Conservation Laws**
- 4. Oscillations and Wave Motion**
- 5. Thermodynamics and Properties of Matter**

*** Complete the following only if course is seeking general education status ***

GENERAL EDUCATION Competencies and Skills *:

In the box to the right of the Competency/Skill, enter all specific **student learning outcome** unit numbers, as indicated in the course outline (i.e. 1.1, 2.7, 4.2, 4.0 and 5.12) that apply.

Course must include <u>all</u> of the following:	
1. Read with critical comprehension**	1.5
2. Write clearly and coherently**	1.6
3. Demonstrate literacy as appropriate within a given discipline**	E) 1.1, 1.2, 1.3, 1.4, 2.0, 3.0, 4.0, 5.0
4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**	1.4, 2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 2.9, 2.10, 2.12, 2.14, 2.15, 3.1, 3.2, 3.3, 3.5, 3.6, 3.7, 4.2, 4.4, 4.6, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10
Course must include at least <u>one</u> of the following:	
5. Differentiate between ethical and unethical behavior	
6. Demonstrate an understanding of the physical, biological, and social environments and how individual behaviors impact this complex system.	3.1, 3.2, 3.3, 5.4
7. Demonstrate an understanding of and appreciation for human diversities and commonalities.	
8. Speak and listen effectively.	

**General Education Competencies and Skills endorsed by 2010-2011 General Education Task Force*

****Required Competencies**

1) Read with critical comprehension.

The student will be introduced to the basic texts, concepts, vocabulary, and methods necessary for developing an understanding of the discipline and meeting the required benchmarks as stated in the course outline.

2) Write clearly and coherently.

The student will demonstrate an understanding and mastery of subject matter in a variety of ways, including writing. Writing activities may include both graded and ungraded essays, short answer quizzes, summaries, reactions, journals, and various other reports.

3) Demonstrate and apply literacy across all the disciplines (indicate which ones apply).

- a) **Information literacy** means understanding how to locate needed information, using the appropriate technology for the task, managing and evaluating the extracted information and using it effectively and ethically.
- b) **Technology literacy** is the ability to responsibly and effectively use appropriate technology to access, manage, integrate, or create information, and/or use technology to accomplish a given task.
- c) **Workplace literacy** is having the appropriate knowledge and skills to communicate and work with others effectively and perform job duties, whether it is through the use of computers and/or other technology.
- d) **Cultural literacy** is recognizing, understanding, and appreciating the similarities and differences between one’s own culture and the cultures of others through a study of the arts, customs, beliefs, values, and history that define a culture.
- e) **Quantitative literacy** is having the ability to formulate, solve and interpret mathematical/statistical operations and graphical/tabular representations to make informed decisions.
- f) **Scientific literacy** means understanding the methodology and application of the scientific process, the physical and biological worlds, and recognizing that scientific knowledge is continuously updated or revised as new information is discovered.

g) Environmental literacy is creating a context within which environmental issues can be viewed, imparting knowledge to enhance one's ability to analyze the issues, make the connections between humans' decisions and actions and the challenges facing the environment, and instilling the desire to sustain the environment through ethical practices in both one's professional and personal lives.

4. Apply problem-solving skills or methods to make informed decisions in a variety of contexts.

The student will use acquired skills or methods to recognize, analyze, adapt, and apply critical thinking to solve problems and make informed decisions.

EVALUATION:

In the box to the right of the Methods of Assessment, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 4.0, 4.2 and 5.12) that apply.

1. Portfolio	
2. Short essays	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10
3. Research Papers	
4. Group projects	
5. Discussions (In class and online)	
6. Multiple Choice tests	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10
7. Presentations	
8. Service Learning Projects	
9. Quizzes (pop, announced, etc.)	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10
10. Take-home tests	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10
11. Summaries, critiques, and analyses	
12. Reaction papers	
13. Surveys	
14. Performance	
15. Short answer tests	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 5.10
16. Classroom debates and colloquia	
17. Blogs, wikis, web pages	
18. Other (Please explain)	

UNITS

Unit 1 Measurement and Vectors and Problem Solving

General Outcome:

- 1.0 The student shall be able to write precise, clear and coherent definitions of appropriate SI units of measurement, and, to use dimensional analysis in solving quantitative word problems, and, to perform basic vector operations in unit vector notation.**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 1.1 Define and apply the appropriate SI units of measurement.**
- 1.2 Use dimensional analysis in assessing the validity of a problem solution.**
- 1.3 Differentiate between scalar and vector quantities.**
- 1.4 Add and subtract vectors using appropriate vector notation.**
- 1.5 Select the relevant data and equations in scientific readings and problems to evaluate the concepts presented in physics.**
- 1.6 Present solutions and evaluations of readings and word problems using the standard formats in physics.**

Common Course Number: PHY2053

Unit 2 Mechanics

General Outcome:

- 2.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving kinematics, dynamics, and static equilibrium.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the students shall be able to:

Kinematics

- 2.1 Apply the equations of motion to the solution of one and two-dimensional motion problems.
- 2.2 Apply radial and tangential vectors to the solution of rotational motion problems.
- 2.3 Relate the description of a particle's motion in a fixed frame of reference to its description in a second frame of reference that is moving relative to the fixed frame.

Dynamics

- 2.4 Define and apply Newton's three laws of motion to the solution of problems involving rotating and non-rotating systems.
- 2.5 Create force diagrams as a technique to aid in solving physics problems.
- 2.6 Define and apply the concept of friction to physics problems.
- 2.7 Define and apply Newton's law of universal gravitation to the solution of problems.
- 2.8 Distinguish between elastic and inelastic collisions.

Statics

- 2.9 Apply the laws of Newton to solve problems dealing with rigid bodies in equilibrium.
- 2.10 Apply the "free body" concept in solving equilibrium problems.
- 2.11 Define torque and angular momentum.
- 2.12 Solving problems with the conservation of angular momentum.
- 2.13 Define work, energy and power in rotational motion.
- 2.14 Apply the laws of the conservation of mechanical energy to a rotating system.
- 2.15 Calculate the moment of inertia.

Common Course Number: PHY2053

Unit 3 Energy and Conservation Laws

General Outcome:

- 3.0 The students shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving work, energy, power and the conservation laws.**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the students shall be able to:

Work, Energy, Power

- 3.1 Define and apply the concept of work, and use the work-energy theorem to solve problems.**
- 3.2 Define and apply the equations for kinetic and potential energy to the solution of problems.**
- 3.3 Define and apply the concept of power to the solution of problems.**

Conservation Laws

- 3.4 Distinguish between a conservative and not-conservative system.**
- 3.5 Calculate the potential energy associated with a given conservative system.**
- 3.6 Define and apply the concept of the conservation of mechanical energy, the conservation of linear momentum, and the conservation of angular momentum in the solution of problems.**
- 3.7 Define and apply the concept of impulse in the solution of problems.**

Common Course Number: PHY2053

Unit 4 Oscillations and Wave Motion

General Outcome:

- 4.0 The students shall be able to write precise, clear and coherent definitions of appropriate concepts, and, analyze and solve quantitative word problems involving the motion for a particle or system of particles that is periodic.**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the students shall be able to:

- 4.1 Define the terms used to describe simple harmonic motion: angular frequency, amplitude, and the period.**
- 4.2 Define and apply the equations of simple harmonic motion to solve problems.**
- 4.3 Differentiate between transverse and longitudinal waves.**
- 4.4 Describe sound as a longitudinal wave and describe its motion through different forms of matter.**
- 4.5 Describe the different acoustical phenomena such as standing waves and the Doppler effect, etc.**
- 4.6 Define and apply the concept of sound intensity level to the solution of problems.**

Common Course Number: PHY2053

Unit 5 Thermodynamics and Properties of Matter

General Outcome:

- 5.0 The student shall be able to write precise, clear and coherent definitions of the properties of matter, and, to use the laws of thermodynamics to analyze and solve quantitative word problems that involve phase changes and other macroscopic changes in the properties of matter.**

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the students shall be able to:

Thermodynamics

- 5.1 Define temperature.**
- 5.2 Define thermodynamic terms such as heat, specific heat, calorimeter, heat capacity, adiabatic, etc.**
- 5.3 Describe the thermal expansion of solids, liquids and gases and the thermal phenomena associated with a phase change.**
- 5.4 Define and apply the laws of thermodynamics to solving problems.**

Properties of Matter

- 5.5 Define and apply the concepts of density, pressure and viscosity to solving problems**
- 5.6 Define and apply the concepts of stress, strain and the moduli of elasticity to solving problems.**
- 5.7 Define and apply the principles of fluid mechanics to solving problems.**
- 5.8 Define and apply Pascal's Principle to problems involving fluid pressure.**
- 5.9 Define and apply the continuity equation to problems involving fluid motion.**
- 5.10 Define and apply Archimedes' Principle to buoyancy problems.**

Sample Problem

1.) Please do the following:

a) In the space provided below, write a precise, clear and coherent definition of the conservation of mechanical energy.

b) A small sphere of mass m initially is moving horizontally with a speed of v_o when it collides with a block of mass M , as represented in the diagram below. The sphere embeds in the block during the brief collision. The block is suspended from a frictionless pivot by a light string of length ℓ . Assuming the conservation of angular momentum during the collision phase and the conservation of mechanical energy in the swinging phase, derive an equation for the angle θ_f , measured with respect to the vertical, through which the string sweeps before the block-sphere system comes to instantaneous rest. For purposes of calculating the moments of inertia, assume the sphere and block are point-like masses.

c) If $M = 15m = 2.250 \text{ kg}$, $v_o = 12.00 \text{ m/s}$, and $\ell = 1.250 \text{ m}$, then calculate the value of θ_f .

