

**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 II**

**COMMON COURSE NUMBER: PHY2054**

**CREDIT HOURS: 3**

**CONTACT HOUR BREAKDOWN**  
*(Per 16 week term)*

**CLOCK HOURS:**  
*(Voc. Course ONLY)*

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

**PREREQUISITE(S): PHY2053 a minimum grade of C**

**COREQUISITE(S): PHY2054L**

**PRE/COREQUISITE(S):**

**COURSE DESCRIPTION** *(750 characters, maximum):*

**PHY2054 is the second course in a two semester sequence, PHY2053 and PHY2054. This sequence includes two laboratory classes: PHY2053L to be taken concurrently with PHY2053, and PHY2054L to be taken concurrently with PHY2054. The topics covered in PHY2054 include: electricity, magnetism and optics. 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): 4 Area  
General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area

**UNIT TITLES**

1. Electric Force and Field
2. Work and Electric Potential Energy
3. Capacitors and Dielectrics
4. Current and Ohm's Law
5. DC Circuits
6. Magnetic Force and Field
7. Electromagnetic Induction and the Properties of Magnetic Materials
8. AC Circuits and Electromagnetic Waves
9. Optics

\*\*\* 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.

<b>Course must include <u>all</u> of the following:</b>	
<b>1. Read with critical comprehension**</b>	4.10
<b>2. Write clearly and coherently**</b>	4.10
<b>3. Demonstrate literacy as appropriate within a given discipline**</b>	E) 1.4, 1.5, 2.4, 2.5, 2.6, 3.2, 3.3, 3.4, 3.5, 4.8, 4.9, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.6, 7.8, 7.11, 7.13, 8.2, 8.3, 8.4, 8.5, 8.6, 8.8, 8.9, 8.10, 8.11, 9.1, 9.2 F) 1.0, 2.0, 3.0, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8., 4.9, 5.0, 6.0, 7.0, 8.0, 9.0
<b>4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**</b>	1.4, 1.5, 1.6, 2.4, 2.5, 2.6, 3.2, 3.3, 3.4, 3.5, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4, 7.6, 7.8, 7.11, 7.13, 8.2, 8.3, 8.4, 8.5, 8.6, 8.8, 8.9, 8.10, 8.11, 9.1, 9.2
<b>Course must include at least <u>one</u> of the following:</b>	
<b>5. Differentiate between ethical and unethical behavior</b>	
<b>6. Demonstrate an understanding of the physical, biological, and social environments and how individual behaviors impact this complex system.</b>	8.4, 8.8, 8.9, 8.11
<b>7. Demonstrate an understanding of and appreciation for human diversities and commonalities.</b>	
<b>8. Speak and listen effectively.</b>	

*\*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, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.1, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12, 7.13, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 9.1, 9.2
3. Research Papers	
4. Group projects	
5. Discussions (In class and online)	
6. Multiple Choice tests	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.1, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12, 7.13, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 9.1, 9.2
7. Presentations	
8. Service Learning Projects	
9. Quizzes (pop, announced, etc.)	
10. Take-home tests	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.1, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12, 7.13, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 9.1, 9.2
11. Summaries, critiques, and analyses	
12. Reaction papers	
13. Surveys	
14. Performance	
15. Short answer tests	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.1, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12, 7.13, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 9.1, 9.2
16. Classroom debates and colloquia	
17. Blogs, wikis, web pages	
18. Other (Please explain)	

## UNITS

### Unit 1 Electric Force and Field

#### General Outcome:

- 1.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving the electric force and the electric field.

#### Specific Measurable Learning Outcomes:

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

- 1.1 Define electric charge and the SI unit used in its measurement.
- 1.2 Distinguish among conductors, insulators and semi-conductors.
- 1.3 Define charging by induction.
- 1.4 Apply Coulomb's Law to the solution of problems involving static charge distributions.
- 1.5 Quantify the magnitude and the direction of an electric field produced by a discrete charge distribution or selected continuous charge distributions.
- 1.6 Apply Gauss' Law to find the electric field produced by various symmetric charge distributions.

Common Course Number: PHY2054

**Unit 2 Work and Electric Potential Energy**

**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 the electric potential and electric potential energy.**

**Specific Measurable Learning Outcomes:**

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

- 2.1 Define electric potential energy and the SI unit used in its measurement.**
- 2.2 Define the electric potential and the SI unit used in its measurement.**
- 2.3 Define and quantify electric potential differences.**
- 2.4 Quantify the electric potential energy for a discrete charge distribution.**
- 2.5 Quantify the electric potential produced by a discrete charge distribution.**
- 2.6 Define and quantify the work done in moving discrete charges.**

Common Course Number: PHY2054

**Unit 3 Capacitors and Dielectrics**

**General Outcome:**

- 3.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving capacitors with or without a dielectric.**

**Specific Measurable Learning Outcomes:**

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

- 3.1 Define capacitance and the SI unit used in its measurement.**
- 3.2 Apply the definition of capacitance to quantify the capacitance of a parallel-plate capacitor without a dielectric.**
- 3.3 Quantify the equivalent capacitance of a set of capacitors in series and parallel.**
- 3.4 Quantify the energy of a charged capacitor.**
- 3.5 Analyze and solve problems involving parallel-plate capacitors with a dielectric.**

Common Course Number: PHY2054

**Unit 4 Current and Ohm's Law**

**General Outcome:**

- 4.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving direct currents.**

**Specific Measurable Learning Outcomes:**

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

- 4.1 Define current and the SI unit used in its measurement.**
- 4.2 Define the current density.**
- 4.3 Define the resistivity of a conductor in terms of the current density.**
- 4.4 Define resistance and the SI unit used in its measurement.**
- 4.5 Define resistor.**
- 4.6 Analyze and apply Ohm's Law to problems involving current and resistors.**
- 4.7 Define electromotive force and the SI unit used in its measurement.**
- 4.8 Analyze and solve problems involving a simple DC circuit comprised of an EMF source, resistor and conductors.**
- 4.9 Quantify the energy dissipated in a resistor in a simple DC circuit.**
- 4.10 Select the correct components and create clearly written solutions for circuit analysis.**

Common Course Number: PHY2054

## **Unit 5 DC Circuits**

### **General Outcome:**

- 5.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving DC circuits.**

### **Specific Measurable Learning Outcomes:**

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

- 5.1 Define and distinguish between series and parallel circuit element configurations.**
- 5.2 Analyze and solve problems involving resistors in series and parallel.**
- 5.3 Apply Ohm's Law and Kirchhoff's Laws to simple and compound DC circuits.**
- 5.4 Analyze and solve problems involving DC R-C circuits.**

Common Course Number: PHY2054

**Unit 6 Magnetic Force and Field**

**General Outcome:**

- 6.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving the magnetic force and field.**

**Specific Measurable Learning Outcomes:**

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

- 6.1 Analyze and solve problems involving the magnetic force exerted on moving point charges.**
- 6.2 Analyze and solve problems involving the force exerted on current-carrying conductors.**
- 6.3 Analyze and solve problems involving the magnetic field produced by moving point charges.**
- 6.4 Use Ampère's Law and the Biot-Savart Law to determine the magnetic fields produced by variously shaped current-carrying conductors.**

Common Course Number: PHY2054

## **Unit 7 Electromagnetic Induction and the Properties of Magnet Materials**

### **General Outcome:**

- 7.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving induced electric fields, induced EMF and the properties of magnetic materials.**

### **Specific Measurable Learning Outcomes:**

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

#### **Electromagnetic Induction**

- 7.1 Analyze and solve problems in motional EMF.**
- 7.2 Apply Faraday's Law to quantify the induced EMF in a closed conducting path.**
- 7.3 Analyze and solve problems involving induced electric fields.**
- 7.4 Apply Lenz's Law to determine the direction of an induced electric field.**
- 7.5 Define eddy currents, mutual inductance and self-inductance.**
- 7.6 Analyze and solve problems involving induction.**
- 7.7 Quantify the energy associated with an inductor.**
- 7.8 Analyze and solve problems involving R-L and L-C circuits.**

#### **Properties of Magnetic Materials**

- 7.9 Define ferromagnetism, paramagnetism and diamagnetism.**
- 7.10 Define magnetic permeability.**
- 7.11 Analyze and solve problems involving magnetization and magnetic intensity.**
- 7.12 Define hysteresis.**
- 7.13 Analyze and solve problems involving self-inductance and magnetic circuits.**

Common Course Number: PHY2054

**Unit 8 AC Circuits and Electromagnetic Waves**

**General Outcome:**

- 8.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving geometrical and physical optics.**

**Specific Measurable Learning Outcomes:**

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

**AC Circuits**

- 8.1 Define AC current.**
- 8.2 Analyze and solve problems involving R-C-L circuits.**
- 8.3 Analyze and solve problems involving the power in AC circuits.**
- 8.4 Define and quantify the resonance in a series R-C-L AC circuit.**
- 8.5 Analyze and solve problems involving a parallel R-C-L AC circuit.**
- 8.6 Analyze and solve problems involving transformes.**

**Electromagnetic waves**

- 8.7 Define and quantify the speed of an electromagnetic wave.**
- 8.8 Analyze and solve problems involving the energy of electromagnetic waves.**
- 8.9 Analyze and solve problems involving electromagnetic waves in matter.**
- 8.10 Analyze and solve problems involving sinusoidal waves.**
- 8.11 Analyze and solve problems involving electromagnetic radiation from an antenna.**

Common Course Number: PHY2054

## Unit 9 Optics

### General Outcome:

- 9.0 The student shall be able to write precise, clear and coherent definitions of appropriate concepts, and, to analyze and solve quantitative word problems involving geometrical and physical optics.**

### Specific Measurable Learning Outcomes:

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

#### **9.1 Analyze and solve geometric optics problems that involve:**

- 9.1.1. Applying the law of reflection and Snell's Law of Refraction to various optical boundaries.**  
**9.1.2. Constructing ray diagrams for mirrors and lenses.**

#### **9.2 Analyze and solve physical optics problems that involve:**

- 9.2.1. Thin-film and double-slit interference.**  
**9.2.2. Single-slit diffraction patterns.**  
**9.2.3. Emission and absorption spectra.**  
**9.2.4. Polarization effects using electric and magnetic field vectors.**