

Standard  Institutionally Developed College: N/A

EDGE Compatible: No

**Pre-requisites**

- PHYS 1111 - Introductory Physics I ( 201003 )
- PHYS 1111L - Introductory Physics Lab I ( 201203 )

**Co-requisites**

- PHYS 1112L - Introductory Physics Lab II ( 201203 )

**Course Description**

The second of two algebra and trigonometry based courses in the physics sequence. Topics include material from electricity and magnetism (electric charge, electric forces and fields, electric potential energy, electric potential, capacitance, magnetism, electric current, resistance, basic electric circuits, alternating current circuits, and electromagnetic waves), geometric optics (reflection and refraction), and physical optics (interference and diffraction).

**Course Length**

	Minutes	Contact Unit
Lecture:	2250	
Lab 2:	0	
Lab 3:	0	
Practicum/Internship:	0	
Clinical:	0	
<b>Total:</b>	<b>2250</b>	<b>3</b>
<b>Semester Credit Hours:</b>		<b>3</b>

**Competencies**

Order	Description	Lecture	Lab2	Lab3	Practicum/ Internship	Clinical	Total Minutes	Semester Credit Hrs
1	Electric Charges, Forces and Fields	300	0	0	0	0	300	
2	Electric Potential Energy, Electric Potential, and Capacitance	400	0	0	0	0	400	
3	Magnetism	400	0	0	0	0	400	
4	Electric Current, Resistance, and Basic Electric Circuits	400	0	0	0	0	400	

Order	Description	Lecture	Lab2	Lab3	Practicum/ Internship	Clinical	Total Minutes	Semester Credit Hrs
5	Alternating Current Circuits	250	0	0	0	0	250	
6	Electromagnetic Waves	100	0	0	0	0	100	
7	Optics	400	0	0	0	0	400	
8		0	0	0	0	0	0	
<b>Totals for Course PHYS 1112 - Introductory Physics II ( version 201003 ):</b>		<b>2250</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2250</b>	<b>3</b>

## Learning Outcomes

### Electric Charges, Forces and Fields

Order	Description	Learning Domain	Level of Learning
1	Distinguish between the two types of electric charge.	Cognitive	Analysis
2	Describe the law of charges that operates between charged objects.	Cognitive	Knowledge
3	Understand and use the law of conservation of charge.	Cognitive	Comprehension
4	Distinguish between conductors and insulators.	Cognitive	Analysis
5	Explain the operation of the electroscope.	Cognitive	Comprehension
6	Distinguish among charging by friction, conduction, induction, and polarization.	Cognitive	Analysis
7	Understand Coulomb's law to calculate the electric force between charged particles.	Cognitive	Comprehension
8	Understand the definition of the electric field.	Cognitive	Comprehension
9	Plot electric field lines and calculate electric fields for simple charge distributions.	Cognitive	Knowledge

### Electric Potential Energy, Electric Potential, and Capacitance

Order	Description	Learning Domain	Level of Learning
1	Understand the concept of electric potential difference (voltage) and its relationship to electric potential energy.	Cognitive	Comprehension
2	Calculate electric potential differences.	Cognitive	Application
3	Explain what is meant by an equipotential surface.	Cognitive	Comprehension
4	Sketch equipotential surfaces for simple charge configurations.	Cognitive	Knowledge
5	Explain the relationship between equipotential surfaces and electric fields.	Cognitive	Comprehension
6	Define capacitance and identify its units.	Cognitive	Knowledge
7	Calculate the charge, voltage, electric field, and energy storage for parallel-plate capacitors.	Cognitive	Application
8	Understand the concept of dielectrics.	Cognitive	Comprehension
9	Calculate the charges, voltages, and energy storage of individual capacitors in series and parallel configurations.	Cognitive	Application

Order	Description	Learning Domain	Level of Learning
11	Analyze capacitor networks that include both series and parallel arrangements.	Cognitive	Knowledge

### Magnetism

Order	Description	Learning Domain	Level of Learning
1	Determine the force rule between magnetic poles.	Cognitive	Application
2	Explain how the direction of a magnetic field is determined with a compass.	Cognitive	Comprehension
3	Determine the magnitude and direction of the magnetic field produced by current carrying wires, loops and solenoids.	Cognitive	Application
4	Use the right-hand rule to determine the direction of the magnetic field from the direction of the current that produces it.	Cognitive	Application
5	Define the magnetic field strength.	Cognitive	Knowledge
6	Determine the magnetic force exerted by a magnetic field on a moving charged particle. (Applications: Charged particles in magnetic fields.)	Cognitive	Application
7	Calculate the magnetic force on a current-carrying wire, and the torque on a current-carrying loop.	Cognitive	Application
8	Explain the concept of the magnetic moment of a coil.	Cognitive	Comprehension
9	Define magnetic flux.	Cognitive	Knowledge
10	Explain how an induced EMF is created. Determine induced EMFs and currents.	Cognitive	Comprehension
11	Understand the operation of electrical generators, and calculate the EMF produced by an AC generator.	Cognitive	Comprehension
12	Explain the origin of back EMF and its effect on the behavior of motors.	Cognitive	Comprehension
13	Explain transformer action in terms of Faraday's Law.	Cognitive	Comprehension
14	Calculate the output of step-up and step-down transformers.	Cognitive	Application
15	Understand the importance of transformers in electric energy delivery systems.	Cognitive	Comprehension

### Electric Current, Resistance, and Basic Electric Circuits

Order	Description	Learning Domain	Level of Learning
1	Understand the properties of a battery.	Cognitive	Comprehension
2	Explain how a battery produces a direct current in a circuit.	Cognitive	Comprehension
3	Explain various circuit symbols for sketching schematic circuit diagrams.	Cognitive	Comprehension
4	Define electric current.	Cognitive	Knowledge
5	Distinguish between electron flow and conventional current.	Cognitive	Analysis
6	Explain the concept of drift velocity and electric energy transmission.	Cognitive	Comprehension
7	Define electric resistance.	Cognitive	Knowledge

Order	Description	Learning Domain	Level of Learning
9	Determine the factors that determine resistance.	Cognitive	Application
10	Define electric power.	Cognitive	Knowledge
11	Calculate the power delivery of simple electric circuits.	Cognitive	Application
12	The equivalent resistance of resistors in series, parallel, and series-parallel combinations.	Cognitive	Knowledge
13	Use equivalent resistances to analyze simple circuits.	Cognitive	Application
14	Understand the physical principles that underlie Kirchhoff's circuit rules. Apply these rules in the analysis of actual circuits.	Cognitive	Comprehension
15	Explain how household circuits are wired.	Cognitive	Comprehension
16	Explain the principles that govern electrical safety devices.	Cognitive	Comprehension
17	Describe the charging and discharging of a capacitor through a resistor.	Cognitive	Knowledge
18	Calculate the current and voltage at specific times during these processes.	Cognitive	Application

#### Alternating Current Circuits

Order	Description	Learning Domain	Level of Learning
1	Specify how voltage, current, and power vary with time in an AC circuit.	Cognitive	Knowledge
2	Understand the concepts of rms and peak values.	Cognitive	Comprehension
3	Explain how resistors respond under AC conditions.	Cognitive	Comprehension
4	Explain the behavior of capacitors in AC circuits.	Cognitive	Comprehension
5	Calculate the capacitive reactance.	Cognitive	Application
6	Explain the behavior of inductors in AC circuits.	Cognitive	Comprehension
7	Calculate the inductive reactance.	Cognitive	Application
8	Calculate the reactance, impedance, current, voltage, power factor, power, and phase angle in AC circuits.	Cognitive	Application
9	Explain the concept of resonance in AC circuits.	Cognitive	Comprehension

#### Electromagnetic Waves

Order	Description	Learning Domain	Level of Learning
1	Recognize Maxwell's equations.	Cognitive	Analysis
2	Explain the relationship between the frequency, wavelength, and speed of electromagnetic waves.	Cognitive	Comprehension
3	Explain the transport of energy by electromagnetic waves.	Cognitive	Comprehension
4	List the various types of electromagnetic waves according to their respective wavelengths.	Cognitive	Knowledge

#### Optics

Order	Description	Learning Domain	Level of Learning
1	Determine the speed of light in various media.	Cognitive	Application
2	Demonstrate knowledge of the dual nature of light.	Cognitive	Application
3	Explain reflection and image formation by plane and spherical mirrors.	Cognitive	Comprehension
4	Explain refraction and image formation by lenses.	Cognitive	Comprehension
5	Solve problems using Snell's law.	Cognitive	Application
6	Explain double slit interference patterns.	Cognitive	Comprehension
7	Explain the behavior of diffraction gratings.	Cognitive	Comprehension

No Learning Outcomes entered for this Course Competency.

## References

Order	Reference Type	Description
1	Book with Author(s) Listed	Giambattista, A., & et al.. (2010). College physics with an integrated approach to forces and kinematics. (3rd). New York, NY: McGraw Hill.
2	Book with Author(s) Listed	Christian, W. & Belloni, M.. (2004). Physlet physics-interactive illustrations, explorations, and problems for introductory physics. (1st). Upper Saddle River, NJ: Pearson / Prentice Hall.
3	Book with Author(s) Listed	Cutnell, J. & Johnson, K.. (2006). Physics. (7th). New York, NY: John Wiley & Sons.
4	Book with Author(s) Listed	Giancoli, D.. (2004). Physics, principles and applications. (6th). Upper Saddle River, NJ: Pearson / Prentice Hall.
5	Book with Author(s) Listed	O'Kuma, T. & et al.. (2004). Ranking task exercises in physics. (Student edition). Upper Saddle River, NJ: Pearson / Prentice Hall.
6	Book with Author(s) Listed	O'Kuma, T. & et al.. (2006). E&M TIPERs: Electricity and magnetism tasks. (1st). Upper Saddle River, NJ: Pearson / Prentice Hall.
7	Book with Author(s) Listed	Serway, R. & Faughn, J. & Vuille, C.. (2009). College physics. (8th). Belmont, CA: Brooks / Cole.
8	Book with Author(s) Listed	Wilson, J. & et al.. (2009). College physics with mastering physics. (7th). ? : Pearson / Addison Wesley.
9	Professional Web Site	North Carolina State University: Advanced Instructional Systems, Inc.. (1997-on going). WebAssign: A web-based assessment system providing homework and test delivery, collection, grading, and recording services. Retrieved ?, from <a href="http://webassign.net">http://webassign.net</a>