Course Title & Number: PHY122: General Physics II

Competency Area: **SCIENTIFIC REASONING** (Goal: Students will become familiar with science as a method of inquiry. Students will develop a habit of mind that uses quantitative skills to solve problems and make informed decisions.)

Faculty submitting the Learning Outcomes: Pete Benzi ***Date***: 3/7/2013

[Instructions: *Please match the Learning Outcomes in the left hand column to those of the course you are submitting for Gen Ed approval. List the corresponding course outcomes in the right hand column to indicate a match.*]

BOR TAP's Learning Outcomes	Corresponding Outcomes for Course Named Above
1. Explain the methods of scientific inquiry that lead to the acquisition of knowledge. Such methods include observations, testable hypotheses, logical inferences, experimental design, data acquisition, interpretation, and reproducible outcomes.	• Distinguish between position, velocity and acceleration. Then employ those concepts to solve harmonic motion problems. • Recognize the similarities between harmonic motion and wave motion and use that to solve waves and sound problems. • Describe Electric fields and demonstrate understanding by solving problems involving forces on charges and electric potential. • Employ Gauss' Law to solve problems involving charges and electric fields. • Discuss the basic principles of magnetic fields. List and calculate the results of charges in motion. • Discuss the basic principles of oscillating charges. Recall the results of harmonic motion and apply these to electro-magnetic waves. • Describe the laws that govern the behavior of light and relate these to electromagnetic waves. • Implement the data collection plan in the laboratory and construct data tables, graphs and charts from data collected. • Evaluate the rigor of conclusions from laboratory experiments by

	comparing different data sets.
2. Apply scientific methods to investigate real-world phenomena, and routine and novel problems. This includes data acquisition and evaluation, and prediction.	● Distinguish between position, velocity and acceleration. Then employ those concepts to solve harmonic motion problems. ● Recognize the similarities between harmonic motion and wave motion and use that to solve waves and sound problems. ● Describe Electric fields and demonstrate understanding by solving problems involving forces on charges and electric potential. ● Employ Gauss' Law to solve problems involving charges and electric fields. ● List the rules governing circuits and demonstrate the functionality of these laws by solving circuit problems. ● Discuss the basic principles of magnetic fields. List and calculate the results of charges in motion. ● Discuss the basic principles of oscillating charges. Recall the results of harmonic motion and apply these to electro-magnetic waves. ● Describe the laws that govern the behavior of light and relate these to electromagnetic waves. ● Implement the data collection plan in the laboratory and construct data tables, graphs and charts from data collected. ● Evaluate the rigor of conclusions from laboratory experiments by comparing different data sets.
3. Represent scientific data symbolically, graphically, numerically, and verbally.	● Implement the data collection plan in the laboratory and construct data tables, graphs and charts from data collected. ● Evaluate the rigor of conclusions from laboratory experiments by comparing different data sets. ● Present data and conclusions in a coherent lab report.

4. Interpret scientific information and draw logical references from representations such as formulas, equations, graphs, tables, and schematics.	● Distinguish between position, velocity and acceleration. Then employ those concepts to solve harmonic motion problems. ● Recognize the similarities between harmonic motion and wave motion and use that to solve waves and sound problems. ● Describe Electric fields and demonstrate understanding by solving problems involving forces on charges and electric potential. ● Employ Gauss' Law to solve problems involving charges and electric fields. ● List the rules governing circuits and demonstrate the functionality of these laws by solving circuit problems. ● Discuss the basic principles of magnetic fields. List and calculate the results of charges in motion. ● Discuss the basic principles of oscillating charges. Recall the results of harmonic motion and apply these to electro-magnetic waves. ● Describe the laws that govern the behavior of light and relate these to electromagnetic waves. ● Implement the data collection plan in the laboratory and construct data tables, graphs and charts from data collected. ● Evaluate the rigor of conclusions from laboratory experiments by comparing different data sets.
5. Evaluate the results obtained from scientific methods for accuracy and/or reasonableness.	● Distinguish between position, velocity and acceleration. Then employ those concepts to solve harmonic motion problems. ● Recognize the similarities between harmonic motion and wave motion and use that to solve waves and sound problems. ● Describe Electric fields and demonstrate understanding by solving problems involving forces on charges and electric potential. ● Employ Gauss' Law to solve problems involving charges and electric fields.

	● List the rules governing circuits and demonstrate the functionality of these laws by solving circuit problems. ● Discuss the basic principles of magnetic fields. List and calculate the results of charges in motion. ● Discuss the basic principles of oscillating charges. Recall the results of harmonic motion and apply these to electro-magnetic waves. ● Describe the laws that govern the behavior of light and relate these to electromagnetic waves. ● Evaluate the rigor of conclusions from laboratory experiments by comparing different data sets. ● Present data and conclusions in a coherent lab report.
	Additional Outcomes Define the Dot and Cross Product and apply those principles to coordinates and vectors. Implement the data collection plan in the laboratory and construct data tables, graphs and charts from the data collected. Describe Electric fields and discuss the advantages of Guass's Law vs Coulomb's Law. Discuss the relationship between Kirchhoff's rules and Faraday's Law. Show that Kirchhoff's rules are only a special case of Faraday's Law. Compare Maxwell's Equations to Newton's Laws. Discuss how this comparison leads to The Special Theory of Relativity. Describe the Special Theory of Relativity and how it modifies Newton's Laws. Consider the quality of information from multiple sources and examine how experimental results are related to the quality of information.