EASTERN ARIZONA COLLEGE
Physics with Calculus II
Course Design
2018-2019

Course Information

Division	Science
Course Number	PHY 212 (SUN# PHY 1131)
Title	Physics with Calculus II
Credits	5
Developed by	Karen Preston
Lecture/Lab Ratio	4 Lecture/3 Lab

Transfer Status

ASU	NAU	UA
PHY 131 (3) & PHY 132 (1) & Elective Credit (1), Natural Science - Quantitative (SQ), Natural Science - Quantitative (SQ)	PHY 262; Science & Applied Science [SAS] --and-- PHY Departmental Elective --and-- PHY 262L	PHYS 241 --and-- PHYS Departmental Elective

Activity Course	No
CIP Code	40.0801
Assessment Mode	Final Exam (11 Questions/110 Points)
Semester Taught	Spring
GE Category	Lab Science
Separate Lab	Yes
Awareness Course	No
Intensive Writing Course	No
Diversity and Inclusion Course	No

Prerequisites

PHY 211

Educational Value

Students majoring in engineering, physics, chemistry, and math.

Description

Covers fundamental principles of electricity and magnetism. Problem solving using calculus.

Supplies

Scientific, preferably graphing calculator

Competencies and Performance Standards

1. Quantify electrostatic interaction using concepts of electric field, electric force, electric potential, and electric energy.

Learning objectives

What you will learn as you master the competency:

a. Apply Coulomb's law and Newton's laws in electrostatic problem solving.

b. Apply Gauss's law in electrostatic problem solving.

c. Determine the electric field due to the uniform distribution of a charge on a line and a surface.

d. Determine the electric potential due to discrete and continuous distribution of a charge.

e. Describe the relationship between in potential and field.

Performance Standards

Competence will be demonstrated:

o on homework

o during class discussion

o on quizzes

o on tests

Criteria - Performance will be satisfactory when:

o learner applies Coulomb's law and Newton's second law to find the resultant force acting on a charge due to several charges

o learner applies the law of conservation of energy to situations involving electric charges

o learner applies Gauss' law to find an electric field due to charge distribution

o learner calculates the electric field and potential due to uniform charge distribution on a line

o learner determines the electric potential by knowing field and vice versa

2. Analyze DC circuits with resistors, capacitors, and inductors.

Learning objectives

What you will learn as you master the competency:

a. Apply Ohm's law and Kirchhoff's law in circuit analysis of resistor circuits with series and parallel connections and loop circuits.

b. Analyze the charging and discharging of capacitors, and determine the time constant of an RC circuit.

c. Analyze circuits with series and parallel connections of capacitors.

d. Analyze charging and discharging, and determine the time constant of an RL circuit.

Performance Standards

Competence will be demonstrated:

o on group projects

o during labs

o on tests

o on quizzes

o during discussions

Criteria - Performance will be satisfactory when:

- o learner determines the total resistance in a circuit with series and parallel combination of resistors
- o learner determines the current through and the voltage across each resistor in a circuit
- o learner determines the net emf due to the combination of batteries
- o learner determines the total capacitance of a combination of capacitors in series and parallel
- o learner determines the charge stored on each capacitor in a circuit
- o learner determines the time constant, the voltage across and the current through the capacitor for an RC circuit

3. Investigate magnetism in various forms due to various sources.

Learning objectives

What you will learn as you master the competency:

- a. Describe ferro, para, and diamagnetism.
- b. Explain the earth's magnetism.
- c. Analyze Ampere's law and Biot-Savart's law for magnetic field due to St. wire and a loop carrying current.
- d. Describe the magnetic field due to a solenoid and a toroid.
- e. Analyze the force acting on a charge and a current due to a magnetic field.
- f. Analyze the force between two wires carrying a current.

Performance Standards

Competence will be demonstrated:

- o on tests
- o on homework
- o on quizzes
- o during labs
- o in group projects

Criteria - Performance will be satisfactory when:

- o learner explains the difference in fero, di and para magnetic materials
- o learner explains the phenomenon of the 'Aurora Borealis'

4. Analyze AC circuits with resistors, capacitors, and inductors.

Learning objectives

What you will learn as you master the competency:

- a. Quantify AC circuits by using capacitive reactance, inductive reactance, and impedance in circuits.
- b. Determine the equivalence in SHM of mass on a spring and LRC circuit.
- c. Use phasor diagrams to explain the behavior of voltage, and currents in AC circuits.
- d. Use oscilloscope in analyzing AC circuits.
- e. Analyze resonance in AC circuits.
- f. Analyze the functioning of radio and television.

Performance Standards

Competence will be demonstrated:

- o on homework
- o on quizzes
- o during lab
- o on tests

Criteria - Performance will be satisfactory when:

- o learner can determine the inductive reactance, capacitive reactance and impedance in the RLC circuit
- o learner draws phasor diagrams for RL, RC and RLC circuits
- o learner uses an oscilloscope to measure AC/DC voltages in circuits
- o learner relates tuning a radio, and television with resonance in electrical circuit
- o learner describes the role of variable capacitor in tuning a radio

5. Investigate the functioning of motor, generator, and transformer.

Learning objectives

What you will learn as you master the competency:

a. Apply Ampere's law, Faraday law of Induction, and Lenz's law using electromagnetic problem solving.

b. Analyze the functioning of a motor, a generator, and a transformer.

Performance Standards

Competence will be demonstrated:

- o on tests
- o during labs
- o on homework
- o on quizzes
- o during group projects

Criteria - Performance will be satisfactory when:

- o learner explains the functioning of a motor, a generator and a transformer
- o learner compares and contrast a motor and a generator

6. Explain the significance of Maxwell's Equations.

Learning objectives

What you will learn as you master the competency:

a. Investigate Maxwell's Equations and electromagnetic radiation.

Performance Standards

Competence will be demonstrated:

- o on tests
- o on homework
- o during group discussion

Criteria - Performance will be satisfactory when:

- o learner explains the origin of the Maxwell's equations

- o learner explains the significance of magnetic permeability and electrical permittivity in terms of speed of light
- o learner explains the production of the electromagnetic spectrum

Types of Instruction

Lecture
Discussions
Demonstrations
Videos
Labs

Grading Information

Grading Rationale

Physics labs	20%
Homework	20%
Unit or Chapter Exams	40%
Final Exam	20%

Grading Scale

A	100 – 90 %
B	80 – 89%
C	70 – 79%
D	60 – 69 %
F	Below 59 %