EASTERN ARIZONA COLLEGE
Physics with Calculus II
Course Design
2011-2012

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

Transfer Status:

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<th>ASU</th>
<th>NAU</th>
<th>UA</th>
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Activity Course: No
CIP Code: 40.0801
Assessment Mode: Pre/Post Test (5 Questions/50 Points)
Semester Taught: Spring
GE Category: Lab Science
Separate Lab: Yes
Awareness Course: No
Intensive Writing 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. Learn 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 can apply Coulomb's law and Newton's second law to find the resultant force acting on a charge due to several charges
   o learner can apply the law of conservation of energy to situations involving electric charges
   o learner can apply Gauss' law to find an electric field due to charge distribution
   o learner can calculate the electric field and potential due to uniform charge distribution on a line
   o learner can determine 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. Investigate the charging and discharging of capacitors, and the time constant of an RC circuit.
   c. Investigate circuits with series and parallel connections of capacitors.
   d. Investigate charging and discharging, and 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
3. **Investigate magnetism in various forms due to various sources.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Investigate ferro, para, and diamagnetism.

b. Investigate the earth’s magnetism.

c. Investigate Ampere’s law and Biot-Savart’s law for magnetic field due to St. wire and a loop carrying current.

d. Investigate the magnetic field due to a solenoid and a toroid.

e. Investigate the force acting on a charge and a current due to a magnetic field.

f. Investigate the force between two wires carrying a current.

*Performance Standards*

*Competence will be demonstrated:*

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

*Criteria - Performance will be satisfactory when:*

- learner can explain the difference in ferro, di and para magnetic materials

- learner can explain 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. Investigate 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.

- Investigate resonance in AC circuits.

- Investigate the functioning of radio and television.
Performance Standards

Competence will be demonstrated:
- on homework.
- on quizzes
- during lab
- on tests

Criteria - Performance will be satisfactory when:
- learner can determine the inductive reactance, capacitive reactance and impedance in the RLC circuit
- learner can draw phasor diagrams for RL, RC and RLC circuits
- learner can use an oscilloscope to measure AC/DC voltages in circuits
- learner can relate tuning a radio, and television with resonance in electrical circuit
- learner understands 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:

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

Performance Standards

Competence will be demonstrated:
- on tests
- during labs
- on homework
- on quizzes
- during group projects

Criteria - Performance will be satisfactory when:
- learner can explain the functioning of a motor, a generator and a transformer
- learner can compare 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:


Performance Standards

Competence will be demonstrated:
- on tests
- on homework
- during group discussion

Criteria - Performance will be satisfactory when:
- learner can explain the origin of the Maxwell's equations.
learner can explain the significance of magnetic permeability and electrical permittivity in terms of speed of light.

learner can explain the production of the electromagnetic spectrum.

**Types of Instruction**
- Lecture
- Discussions
- Demonstrations
- Videos
- Labs

**Grading Information**

**Grading Rationale**
Students are graded for critical thinking, application skills and not on memory. Students are also graded for class participation, and communication skills.

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<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Pre-test</td>
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<td>Labs</td>
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<td>Final</td>
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<tr>
<td>Posttest</td>
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**Grading Scale**
- **A** 88% and above
- **B** 78% to 87.9%
- **C** 68% to 77.9%
- **D** 58% to 67.9%
- **F** below 57.9%