College Of DuPage **Implementation Date:** Fall/05

ACTIVE COURSE FILE

B. *Curricular Area: Physics Course Number: 1202

Course Title: General Physics II

Semester Credit Hours: 5 Lecture Hours: 4 Lab Hours: 2 Clinical Hours: 0

*Changes from the present course must be accompanied by a yellow Course Revision or Deletion Form.

Course description to appear in catalog:

Algebra-based study of electrostatics, electric fields, Gauss' law, capacitance, current, resistance, magnetic forces and fields, electromagnetic induction, DC and AC circuits, electromagnetic waves, mirrors, lenses, optics, and modern physics.

Prerequisite: Physics 1201 with a grade of C or better

A. General Course Objectives

Upon successful completion of this course the student should be able to do the following:

1. Calculate the forces on static electrical charges using Coulomb's law
2. Calculate the strengths of electrical fields using Gauss' law
3. Calculate the capacitance of and the energy stored in an electrical capacitor
4. Explain the concepts involved in each of Maxwell's equations
5. Calculate the magnetic field caused by a moving charge
6. Calculate the force on a moving charge due to a magnetic field
7. Formulate current flow and voltage drop on various parts of a simple electrical circuit including resistors, capacitors, and inductors
8. Relate the wave and ray methods of modeling light travel
9. Construct a ray diagram of a lens showing the location of an image using principle rays
10. Construct a ray diagram of a mirror showing the location of an image using principle rays
11. Use Snell's law to calculate refraction in lenses and surface boundaries
12. Calculate the position of maxima and minima of light from double slit interference
13. Recognize the constancy of the speed of light as one of the fundamental principles of special relativity
14. Explain the paradox in the photoelectric effect
15. List the major types of radioactive decays and important aspects of each
16. Calculate decay rates and half-lives
17. List the different ways of quantifying radioactive activity and explain the differences
18. Explain the biological effects of ionizing radiation
19. Describe the basic workings of a nuclear power reactor

B. Topical Outline

1. Electric charge
   a. Coulomb's law
   b. Units of charge
   c. Quantization of charge
   d. Conservation of charge
   e. Linear superposition and Coulomb's law
   f. Definition and units for electric field

2. Gauss' law
   a. High symmetry and Gauss' law
   b. Applications of Gauss' law
   c. Electric potential energy
   d. Definition and units of potential difference
   e. Calculation of potential difference
   f. Relation between potential difference and the electric field

3. Capacitance
   a. Capacitors
   b. Calculation of capacitance
   c. Capacitive circuits
   d. Energy stored in a capacitor

4. Current and resistance
   a. Electric current
   b. Resistivity and resistance of a wire
   c. Ohm's Law for resistive media
   d. Energy and charge conservation in resistive circuits
   e. Batteries and circuits
   f. Simple cases of resistive circuits

5. Magnetic fields
   a. Magnetic force on a moving charge
   b. Torque on a current-carrying wire
   c. Helical motion of charges in uniform magnetic fields
   d. The mass spectrometer and measurement of momentum and voltage for moving charges
   e. Particle accelerators

6. Magnetic fields due to currents
   a. Current carrying wire in magnetic fields
   b. Current loops in magnetic fields (magnetic dipoles)
   c. Electric motors
   d. Production of magnetic fields by moving charges
   e. Current elements and the Biot-Savart law
   f. Special cases for the production of magnetic fields
   g. Magnetic lines of force
   h. Symmetry and the production of magnetic fields using Ampere's law

7. Induction and inductance
    a. Induced voltages and Faraday's law
    b. Lenz' law and induced voltages
    c. Mutual induction
    d. Self induction
    e. Simple and complex inductive circuits

8. AC circuits
    a. Capacitive and inductive reactances
    b. Series and parallel circuits
    c. Impedance
    d. Power

9. Electromagnetic waves
    a. Nature of electromagnetic waves
    b. Energy carried by electromagnetic waves
    c. Polarization

10. Reflection
    a. Waves versus rays
    b. The law of reflection
    c. Plane and spherical mirrors
    d. Image formation

11. Refraction
    a. Snell's law of refraction
    b. Thin lens equation
    c. Total internal reflection
    d. Prisms and lenses

12. Interference
    a. Interference from two or more light sources
    b. Single slit diffraction
    c. The diffraction grating--wave length measurement

13. Special relativity
    a. Relativistics of time, mass, and length
    b. Equivalence of mass and energy

14. Particles and waves
    a. Photoelectric effect
    b. Waves
    c. Uncertainty principle
    d. Bohr model of the atom

15. Atomic and nuclear physics
    a. Nuclear and atomic structure
    b. Isotopes
    c. Binding energy
    d. Radioactivity
    e. Half-life
    f. Fusion and fission
    g. Reactors

C. Methods of Evaluating Student:

Students will be evaluated using a combination of grades from homework, quizzes, and tests along with assessment of lab methods.

Initiator	Date	Division Dean	Date
Sponsor	Date		

PHY1202
tgc:04/12/04