

Prepared by Department of Natural Sciences & Applied Technology

Date of Departmental Approval: March 23, 2009

Date approved by Curriculum and Programs: November 9, 2009

Effective: Fall 2010

1. **Course Number: PHY212 and PHY212L**
Course Title: University Physics II and University Physics II Laboratory
2. **Description:** Second semester of a two-semester introduction to university physics using calculus. This course covers vibrations and waves; electricity and magnetism; optics; and a brief introduction to modern physics. The course is appropriate for math, science, and engineering students. Calculus will be used throughout the course. *Students must have taken, or be currently enrolled in Calculus II (MAT 250) (3 class hours / 1 recitation hour / 2 laboratory hours)*
3. **Student Learning Outcomes:**
Upon successful completion of this course, students are able to do the following:
 - Describe the scope of the field of Physics and its basic historical development.
 - Effectively utilize appropriate quantities and units to describe physical phenomena.
 - Use a variety of devices and instruments in taking laboratory measurements.
 - Use appropriate techniques in the laboratory, collect and analyze meaningful data, and present clearly and cogently written laboratory results (utilizing Standard American English) including some error analysis.
 - Use word processing and spreadsheet software to prepare and present laboratory reports.
 - Use a scientific calculator as a tool in solving a wide variety of problems.
 - Work cooperatively in a small group setting to complete various laboratory exercises, following the written instructions provided.
 - Describe and discuss electric charges, forces and fields, including Coulomb's Law.
 - Apply the ideas of energy to electricity.
 - Describe the magnetic field.
 - Describe and analyze the interactions between magnetic fields and electric particles.
 - Interpret Maxwell's Equations.
 - Solve (using algebra and trigonometry as tools) all one concept problems presented that involve any of the topics included in this course.
 - Solve (using algebra, trigonometry and - occasionally- calculus as tools) almost all "two and three concept" problems from the same list of topics.
 - Solve (using algebra, trigonometry and - occasionally - calculus as tools) some "many concept" problems from the same list of topics.
 - Explain some of the ways in which Physics can be applied to the problems of society in general.
4. **Credits:** 4 credits
5. **Satisfies General Education Requirement:** Natural or Physical Science
6. **Prerequisite:** Grade of "C" or better in PHY211
7. **Semester(s) Offered:** Varies
8. **Suggested General Guidelines for Evaluation:** Grades will be class work; homework; one-hour tests; laboratory work and reports; and a final examination
9. **General Topical Outline (Optional):** See attached.

PHY212. University Physics II Content Outline

I. Simple harmonic motion (SHM) and waves

- A. Vibrations and oscillations
 - 1. Hooke's law
 - 2. Acceleration, velocity, and position
- B. Waves
 - 1. Description and types
 - 2. Velocity
 - 3. Superposition, interference, reflection
- C. Sound
 - 1. Energy and intensity - the db scale
 - 2. The Doppler effect
- D. Music and sound quality

II. Electricity

- A. Electric charges, forces, and fields
 - 1. Coulomb's Law
 - 2. Electric field
- B. Electrical energy
 - 1. Electrical potential energy
 - 2. Potential difference
- C. Capacitance
- D. Current and Resistance (mainly in laboratory)
 - 1. Ohm's Law
 - 2. Electrical energy and power
- E. D.C. Circuits (exclusively in laboratory)
 - 1. Series and Parallel circuits
 - 2. Kirchoff's Laws

III. Magnetism and Electromagnetism

- A. Magnetism
 - 1. Magnets and magnetic fields
 - 2. Force between a moving charged particle and a magnetic field.
- B. Induction - Faraday's Law
- C. Electromagnetic Waves
 - 1. Maxwell's Equations (simplified)
 - 2. Properties and spectrum of EM waves
- D. Superconductivity

IV. Light and Optics (Geometric) (in laboratory only)

- A. Properties of Light
- B. Geometric Optics
 - 1. Reflection and refraction
 - 2. Mirrors and Lenses
- C. Wave Optics

V. Introduction to Modern Physics (mainly historic and qualitative)

- A. Quantum Physics
- B. Atomic Physics
- C. Nuclear Physics
- D. Cosmology