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Course Description (from Undergraduate Bulletin, 2009-2010): PHY 121, 4 Credits
This is the sequel to PHY 120. The topics include wave motion, acoustics, optics, electricity, magnetism, physics of the atom, and physics of the nucleus. Prerequisite: PHY 120. Laboratory fee.

Text: There are three textbooks, volumes 3 through 5 of the Light and Matter series:
Electricity and Magnetism, Edition 2.3, by Benjamin Crowell. ISBN 0-9704670-4-4

Textbook Websites (full text available free online):
www.lightandmatter.com/area1book4.htm
www.lightandmatter.com/area1book5.htm

We will cover most of all three books, in order.

Laboratory Experiments: There will be ten laboratory experiments performed during the course. Full lab reports will be collected and graded. The laboratory constitutes 25% of the course grade.

• Simple Harmonic Motion (SHM and conservation of energy)
• Waves on a String (standing waves)
• Sound Resonance in a Tube (measuring the speed of sound)
• Electric Charges (attraction and repulsion; Faraday’s ice pail experiment)
• Digital Multimeters (familiarizing student with meters)
• Resistors and Diodes (Ohm’s law and basic circuit elements)
• DC Circuits (Simple circuits and Kirckoff’s Rules)
• Magnetic Fields (using a compass to map a field)
• Geometric Optics (reflection and refraction)
• Lenses (Thin lens equation)
• Diffraction (single slits and measuring the width of a human hair)

Topics Covered in PHY 121
Book 3: Vibrations and Waves
Chapter 1 Elasticity; Springs and Hooke’s Law
Oscillating Masses, Simple Harmonic Motion; Timekeeping
Chapter 2 Energy and SHM; Damped and Driven Systems; Resonance
Chapter 3 Wave Basics, Reflection, Transmission, Absorption
Strings, Sound Waves, Standing Waves, Resonance
Doppler Shifts; the Big Bang
Chapter 4 Bounded waves; interference effects

Book 4: Electricity and Magnetism
Chapter 1 Electric charges; quantized charge; atoms and atomic models; leptons, baryons, and quarks
Chapter 2 Atomic nuclei; radioactivity; nuclear structure; string and weak forces
Nuclear fusion; biological effects of ionizing radiation
Chapter 3 Conductors and insulators; current; batteries and voltage

continued on reverse side
resistance; resistance and temperature; superconductivity

Chapter 4  Circuit diagrams; elements in parallel and series; Kirchoff’s Rules
Chapter 5  Fields and forces; gravitational fields (review); electrical fields; non-uniform fields
Chapter 6  Electromagnetism; magnetic fields; magnetic forces; induction; electromagnetic waves
Chapter A  Capacitors; capacitors in parallel and series; RC circuits
          Inductors; inductors in RL circuits
          Oscillations; Impedance

Book 5: Optics
Chapter 1  Ray model of light; photon model of light; geometric optics
Chapter 2  Reflection; images by reflection; Fermat’s Principle
Chapter 3  Describing Images; aberrations
Chapter 4  Refraction; images by refraction; Fermat’s Principle
Chapter 5  Electromagnetic waves; diffraction; Huygens’s Principle
          Principles of Lasers