

Department: Science Department

Course Name: AP Physics II

Course Description:

This two-semester course concentrates on the basic principles of physics equivalent to a second-semester college course in algebra-based physics and is appropriate for students interested in pursuing further scientific or technical interests in college. Topics studied include fluid mechanics, thermodynamics, electricity & magnetism, optics, atomic, nuclear, relativity, and special topics modern/quantum physics. A strong emphasis is placed on problem solving. Mathematical relationships are developed and applied. This is a full laboratory course and completion of formal laboratory reports is required. Prerequisites for this course include AP Physics I and Pre-Calculus (or higher) math. Grades in both classes should be at least B+. AP Physics II is a course with a high degree of difficulty and a consistently demanding workload. AP Physics II students complete an average of three major lab reports every quarter. Students will complete homework assignments using the internet-based system “WebAssign” therefore students enrolled in this course must have home access to a computer and the internet. A small fee will be charged for WebAssign access

Content:

Mechanics Review

Fluid Dynamics

Pressure and Density

Pressure variation with depth

Pascal’s principle

Mass and volume flow rate

Continuity principal and equation

Bernoulli’s principal and equation

Temperature and Heat

Specific and latent heat (calorimetry)

Heat transfer (conduction, convection, radiation, Newton’s law of cooling)

Thermal expansion

Kinetic Molecular Theory (Kelvin Temperature)

Ideal gases

Laws of Thermodynamics (Carnot cycle, heat engines, entropy)

Wave motion

Traveling and standing waves (harmonics in tubes and strings)

Doppler Effect

Superposition (resonance)

Physical Optics (Snell’s law, specular reflection)

Geometric Optics (reflection/refraction with mirrors and lenses)

Interference and diffraction (single-, double-, multi-slit)

Dispersion of light and electromagnetic spectrum

Electrostatics

Charge, field, potential

Coulomb’s law

Conductors, Capacitors and Dielectrics

Electric Circuits

Ohm’s Law

Equivalent resistance and capacitance

Kirchhoff's voltage and current rules
Magnetostatics
Forces on moving charges in magnetic fields
Forces on current carrying wires in magnetic fields
Magnetic fields of long current carrying wires (Ampere's Law)
Electrodynamics
Faraday's law of induction (AC/DC motors and generators)
Lenz's law (polarity of induced EMF)
Special Relativity
Atomic physics and quantum effects (Pauli exclusion principle)
Photons and photoelectric effect
Bohr model of Hydrogen (energy levels, transitions)
Wave-particle duality
X-Ray production
Compton scattering
Nuclear Reactions (Alpha-Beta-Gamma-Decay, Fission, Fusion)
Radioactivity and half-life (Carbon dating)
Nuclear reaction symmetries (conservation of electric charge, baryon number, lepton number, etc.)
Electroweak unification (W^+ , Z^0 , γ - gauge, and Higgs particles)
Quarks and leptons (color, gluons, strong interactions, QCD)

Skills:

Collaborate to gather data*
Generate and interpret data in graphical form
Construct sophisticated lab reports with computer generated graphics and equations
Analyze and represent data graphically using spreadsheets
Utilize advanced features of a scientific graphing calculator

Text and Materials:

Serway & Faughn, College Physics (Saunders College Publishing. 6th edition, 2001)
(WebAssign Homework account required www.webassign.net)
AP Classroom Daily Videos*
Online virtual labs*
Laptop cart with IBM Think-Pad Laptops

Methods of Instruction:

Utilize a Learning management system for accessing content, assignments, and assignment submission
Lecture
Real time (live) demonstrations
Java Applets, Internet, DVD computer demonstrations
Laboratory experiments*
Homework tutorials
Quiz, Test, and Homework review
iPad notes, apps, and visualizations*
iPad wireless data collection and analysis

Methods of Evaluation:

Laboratory experiments*
Laboratory procedure*

Classroom productivity
Data analysis
Laboratory reports
Inquiry labs
Activity worksheets*
Homework (online WebAssign*)
Quizzes (online AP Classroom*)
Tests (online AP Classroom*)

*In response to COVID students are required to wear masks in the classroom. Some online assessments and virtual lab activities implemented during remote learning have been incorporated into new computer-based classroom activities. Washing of hands after every lab is enforced.

