Department: Science Department
Course Name: Advanced Placement 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 thermodynamics, electricity & magnetism, waves, optics, atomic, nuclear, 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. AP Physics II is a course with a high degree of difficulty and a consistently demanding workload.

Content:
Temperature and Heat
Kinetic Molecular Theory (Kelvin Temperature)
Ideal Gas Law
Specific and latent heat (calorimetry)
Heat transfer (conduction, convection, radiation, Newton's law of cooling)
Thermal expansion
Laws of Thermodynamics (Carnot cycle, heat engines, efficiency, entropy)
Wave motion
Traveling and standing waves
Superposition Principle
Physical Optics (Snell's law, specular reflection)
Geometric Optics (reflection/refraction with mirrors and lenses, images)
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^{o}, 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:
Raymond A. Serway and Chris Vuille, College Physics (Cengage Learning. 11th edition, 2016)
AP Classroom Daily Videos
Online virtual labs
Laptop cart with laptops

Methods of Instruction:
Utilize a Learning management system for accessing content, assignments, and assignment submission
Lecture
iPad data collection and analysis
Real time (live) demonstrations
Laboratory experiments
Inquiry based labs
Excel Data analysis tutorials
Homework tutorials
Quiz and Test review
Online Interactive Virtual Labs
AP-Classroom Daily Videos

Methods of Evaluation:
Laboratory collaboration
Data analysis
Laboratory reports
Laboratory procedure
Homework
Quizzes (in-class and online)
Tests (AP-Classroom online)