Murrieta Valley Unified School District
High School Course Outline
April 2013

Department: Science

Course Title: AP Physics

Course Number: 3531

Grade Level: 11, 12

Length of Course: Year

Prerequisite: Completion of Chemistry with a grade of "B" or better and concurrent enrollment or completion of Pre-Calculus.

A-F Requirement: D

I. Goals

The student will:

A. Analyze the motion of an object in terms of applied forces, velocity, and acceleration with the inclusion of the concept of gravity

B. Describe the conservative properties of energy and momentum as particles of matter interact with one another

C. Demonstrate an understanding of kinetic theory as it applies to matter, heat transfer, and the laws of thermodynamics

D. Apply the properties of waves to sound and the electromagnetic spectrum (light), including the application of geometric optics

E. Utilize knowledge of static electricity and electric current in the process of electromagnetic induction

F. Understand the relationship of magnetic fields and electric current in the process of electromagnetic induction

G. Demonstrate knowledge of modern physics, including relativity, quantum effects, and nuclear physics

H. Recognize and solve physical problems by experimental investigation,

formal logic, and mathematical reasoning when appropriate

II. Outline of Content for Major Areas of Study

Semester I:

Newtonian Mechanics

A. Kinematics – vectors, displacement, velocity, and acceleration

1. Motion in one dimension
2. Motion in two dimensions (projectile motion)

B. Force and Newton's laws of motion

1. Forces (including friction and centripetal force)
2. Static equilibrium (first law)
3. Dynamics of a single particle (second law)
4. Systems of two or more bodies (third law)

C. Circular motion, oscillations, and gravitation

1. Uniform circular motion
2. Simple harmonic motion
3. Mass on a spring
4. Pendulum and other oscillations
5. Newton's law of gravity
6. Orbits of planets and satellites

D. Work, energy, and power

1. Work and energy theorem
2. Conservation of energy
3. Power

E. Linear and angular momentum (including rotation)

1. Impulse and momentum
2. Conservation of linear momentum, collisions
3. Angular momentum and its conservation
4. Torque and rotational statics

Thermal Physics

F. Fluids

1. Pascal's principle

2. Archimedes' principle
3. Bernoulli's principle

G. Kinetic theory, temperature, and heat

1. Kinetic model
2. Thermal expansion
3. Ideal gas law
4. Mechanical equivalent of heat
5. Specific and latent heat (calorimetry)
6. Heat transfer

H. Laws of thermodynamics

1. First law of thermodynamics
2. Second law of thermodynamics

Waves and Optics

I. Wave motion and sound

1. Properties of traveling waves
2. Properties of standing waves
3. Doppler effect
4. Superposition

J. Physical optics

1. Interference and diffraction
2. Dispersion of light and the electromagnetic spectrum

K. Geometric optics

1. Reflection and refraction
2. Mirrors
3. Lenses

Semester II:

Electricity and Magnetism

A. Electrostatics, conductors, and capacitors

1. Charge, field, and potential
2. Coulomb's law and field and potential point charges
3. Fields and potentials of planer charger distributions

4. Electrostatics with conductors
5. Capacitors

B. Electric circuits

1. Current, resistance, power
2. Steady-state direct current circuits with batteries and resistors only
3. Capacitors in circuits

C. Magnetostatics

1. Forces on moving charges in magnetic fields
2. Forces on current-carrying wires in magnetic fields
3. Fields of long current-carrying wires

D. Electromagnetism

1. Electromagnetic induction (Faraday's law and Lenz's law)

Relativity, Atomic and Nuclear Physics

E. Relativity

1. Postulates of special relativity
2. Results of special relativity
3. Space-time
4. Energy-mass equivalence

F. Atomic physics and quantum effects

1. Alpha particle scattering and the Rutherford model
2. Photons and the photoelectric effect
3. Bohr model and energy levels
4. Wave-particle duality

G. Nuclear Physics

1. Radioactivity and half-life
2. Nuclear reactions

III. Accountability Determinants

A. Teacher observations of day-to-day classroom participation and problem solving ability

B. Performance on laboratory component of the course by evaluation of formal lab write-ups

C. Individual performance exams and quizzes

IV. AP Exam Requirement

Students attempting to receive college credit for Advanced Placement and International Baccalaureate courses are required to pass a College Board exam which validates coursework. This exam **is not a requirement** for District High School credit, grade increases, or extra credit.

Student fees are allowable for Advanced Placement and International Baccalaureate Diploma examinations **for college credit**, so long as (1) taking the exam is not a course requirement; (2) the exam results have no impact on a pupil's grade or credit in a course; and (3) eligible economically disadvantaged high school pupils who receive school district funding towards the exam fee shall pay $5.00 of the fee. (EC sections 52240-52244; 52920-52922.)

V. Required Text(s)

Giancoli, Douglas C. *Physics, Principles with Applications,* 5th Edition, Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1998

VI. Supplementary Materials

A scientific calculator is required for this course and the AP exam