Course Description

The AP Physics Year 2 course follows an Algebra - Based Curriculum framework that is structured around seven "big ideas" of physics that include core scientific principles, theories, and processes. The framework encourages instruction that allows students to make connections across domains through a broader way of thinking about the physical world. Big ideas cut across the traditional physics principles and are supported with enduring understandings, which incorporate the core concepts that students should retain from their learning experiences.

Big idea 1: Objects and systems have properties such as mass and charge. Systems may have internal structure.

Big idea 2: Fields existing in space can be used to explain interactions.

Big idea 3: The interactions of an object with other objects can be described by forces.

Big idea 4: Interactions between systems can result in changes in those systems.

Big idea 5: Changes that occur as a result of interactions are constrained by conservation laws.

Big idea 6: Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.

Big idea 7: The mathematics of probability can be used to describe the behavior of complex systems and to interpret the behavior of quantum mechanical systems.

This course also provides students with opportunities to engage in the AP Science Practices, whereby they establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. Focusing on these reasoning skills enables teachers to use the principles of scientific inquiry to promote a more engaging and rigorous experience for AP Physics students.

I. Major - 60%
   A. Unit Exams – 3x
   B. Free Response – 2x
   C. Quizzes – 1x

II. Minor – 40%
   A. Laboratories/Projects -1x
   B. Homework -1x

Classroom Policies

I. Absences:

A. Please refer to the Student Code of Conduct for more information.

II. Tardies:

A. Students receiving a tardy, three or more times a semester will lose their semester exam exemption. In addition, students will receive an unexcused absence, if they are tardy three or more times during a grading period.

III. Make - up work:

A. *Excused absences*: The amount of time allowed for completion of make-up work should not exceed the number of days absent. You may contact me by e-mail to request extending the due date. Students will not receive an incomplete for late work. Students should refer to the course calendar for assignments missed during an absence.
B. *Unexcused absences*: Work missed during an unexcused absence, will not receive credit.

IV. Behavior:

A. Behavior problems, including cheating are subject to discipline in accordance with the Student Code of Conduct.

V. Grade reporting:

A. Student's may review their grades on line. They should contact me immediately if they have any questions about their grades.

Scope & Sequence

1st Semester

I. First Nine Weeks

A. **Unit I: Fluids (Chp. 10)**
   i. Fluid Systems
   ii. Density
   iii. Fluids: Pressure and Forces
   iv. Fluids and Free-Body Diagrams
   v. Buoyancy
   vi. Conservation of Energy in Fluid Flow
   vii. Conservation of Mass Flow Rate in Fluids

B. **Unit II: Thermodynamics (Chps. 12 - 15)**
   i. Thermodynamic Systems
   ii. Pressure, Thermal Equilibrium, and the Ideal Gas Law
   iii. Thermodynamics and Forces
   iv. Thermodynamics and Free-Body Diagrams
   v. Thermodynamics and Contact Forces
   vi. Heat and Energy Transfer
   vii. Internal Energy and Energy Transfer
   viii. Thermodynamics and Elastic Collisions: Conservation of Momentum
   ix. Thermodynamics and Inelastic Collisions: Conservation of Momentum
   x. Thermal Conductivity
   xi. Probability, Thermal Equilibrium, and Entropy
      a. Optional Project(s)
         1. Rube Goldberg Apparatus
         2. Building a Lightweight Solar Oven

II. Second Nine Weeks

A. **Unit III Electric Force, Field, and Potential (Chps. 18 - 19)**

i. Electric Systems
ii. Electric Charge
iii. Conservation of Electric Charge
iv. Charge Distribution— Friction, Conduction, and Induction
v. Electric Permittivity
vi. Introduction to Electric Forces
vii. Electric Forces and Free-Body Diagrams
viii. Describing Electric Force
ix. Gravitational and Electromagnetic Forces
x. Vector and Scalar Fields
xi. Electric Charges and Fields
xii. Isolines and Electric Fields
xiii. Conservation of Electric Energy

B. **Unit IV Electric Circuits (Chps. 20, 23)**

i. Definition and Conservation of Electric Charge
ii. Resistivity and Resistance
iii. Resistance and Capacitance
iv. Kirchhoff's Loop Rule
v. Kirchhoff's Junction Rule and the Conservation of Electric Charge
    a. Optional Project
        1. Building a Van de Graaf Generator

2nd Semester

III. First Nine Weeks

A. **Unit V: Magnetism and Electromagnetic Induction (Chps. 21 – 23, 24)**

i. Magnetic Systems
ii. Magnetic Permeability and Magnetic Dipole Moment
iii. Vector and Scalar Fields
iv. Monopole and Dipole Fields
v. Magnetic Fields and Forces
vi. Magnetic Forces
vii. Forces Review
viii. Magnetic Flux

B. **Unit VI: Geometric and Physical Optics (Chps. 25 - 27)**

i. Waves
ii. Electromagnetic Waves
iii. Periodic Waves
iv. Refraction, Reflection, and Absorption
v. Images from Lenses and Mirrors
vi. Interference and Diffraction
    a. Optional Project(s)

1. Building an electric motor
2. Building a Pinhole Camera

III. Second Nine Weeks

A. **Unit VII: Quantum Atomic, and Nuclear Physics (Chps. 28 - 31)**

i. Systems and Fundamental Forces
ii. Radioactive Decay
iii. Energy in Modern Physics (Energy in Radioactive Decay and $E = mc^2$)
iv. Mass–Energy Equivalence
v. Properties of Waves and Particles
vi. Photoelectric Effect
vii. Wave Functions and Probability

a. Optional Project

1. Building a Simple Spectroscope