Milpitas Unified School District
Course Presentation

Title of Course: AP Physics 2

Course Duration: 1 School Year
Credits: 10
Grade Level: 11- 12
Department: Science
Submitted by: Kathleen Downum
Date: August 2017

Prerequisites: AP Physics 1 or A in college prep physics
Sequence:
Magnet: N/A
Academy: N/A
UC/A-G Approved: will be submitted
Course Catalog Information: AP Physics 2 is the second part of a two course sequence. It is equivalent to most college-level introductory physics courses with a focus on the following topics: fluid statics and dynamics, thermodynamics, PV diagrams and probability, electrostatics, electrical circuits and capacitors, magnetic fields, electromagnetism, physical and geometric optics, and other topics in modern physics. Emphasis will be placed on understanding physical science literacy and applying physics concepts to think critically and solve problems. Algebra and trigonometry are the primary mathematical tools for problem solving. Science literacy is the process of both knowing physics and doing physics. Hands-on laboratory work and communicating results will be emphasized.

Mission
Students will complete a rigorous introduction to high school and introductory college level physics.

Beliefs

Course Objectives
Earn a score of 3 or higher on the AP Physics 2 exam administered in May.

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Major Units of Study

The following is a summary of the material to be covered and basic skills to be mastered:

- Special relativity
- Thermodynamics
- Fluid statics & dynamics
- Electric forces, fields, and potential
- Electric circuits
- Magnetism
- Electromagnetic induction
- Geometric optics
- Physical optics
- Atomic physics
- Nuclear physics
- Quantum physics

Standards Met

NGSS

- HS-PS1-8 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
- HS-PS2-4 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
- HS-PS2-5 Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
- HS-PS3-1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
- HS-PS3-2 Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and the energy associated with the relative positions of particles (objects).
- HS-PS3-4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
- HS-P3-5 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.

- HS-PS4-1 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
- HS-PS4-3 Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

AP Physics 2 “Big Ideas”

1. Objects and systems have properties such as mass and charge. Systems may have internal structure
2. Fields existing in space can be used to explain interactions.
3. The interactions of an object with other objects can be described by forces.
4. Interactions between systems can result in changes in those systems.
5. Changes that occur as a result of interactions are constrained by conservation laws.
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.
7. The mathematics of probability can be used to describe the behavior of complex systems and to interpret the behavior of quantum mechanical systems.

AP Physics 2 “Science Practices”

1. The student can use representations and models to communicate scientific phenomena and solve scientific problems.
2. The student can use mathematics appropriately.
3. The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.
4. The student can plan and implement data collection strategies in relation to a particular scientific question.
5. The student can perform data analysis and evaluation of evidence.
6. The student can work with scientific explanations and theories.
7. The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

Reading Materials

Giancoli, D. *Physics: Principles with Applications.* 6th Edition. Upper Saddle River, NJ: Prentice Hall/Pearson Education, 2005.