Physics 1 and AP Physics Syllabus

1) Course Title

Advanced Placement Physics

2) Overview of the Physics Program

The school day consists of eight 42 minute periods. Physics 1 and AP Physics both meet seven times a week. Two days a week students have my class for two consecutive periods, thus allowing time for a two-period lab. AP Physics is taken by seniors who have already completed Physics 1 in their junior year. Since I teach all sections of both of these courses, I can adjust the curriculum timing to insure that all topics are covered before the exam in May of their senior year.

3) Scope and Sequence of Material

I have included the scope and sequence for both courses below. The chapter numbers refer to the chapters in my main textbook – Holt Physics. The "Advanced Topics" come from a section following the final chapter in the textbook. I also supplement the information with the Giancoli textbook. See the bibliography for more information.

Scope and Sequence for Physics 1 and AP Physics

I. Physics 1 – Junior year
   a. First Nine Weeks
      i. Chapter 1 The Science of Physics
      ii. Chapter 2 Motion in One Dimension
      iii. Chapter 4 Forces and the Laws of Motion
   b. Second Nine Weeks
      i. Chapter 5 Work and Energy
      ii. Chapter 6 Momentum and Collisions
      iii. Chapter 7 Circular Motion and Gravitation
   c. Third Nine Weeks
      i. Chapter 8 Fluid Mechanics
         1. Buoyant Force
         2. Fluid Pressure
         3. Pascal's Principle
         4. Submerged Pressure
         5. Bernoulli's Principle
         6. Ideal Gas Law
         7. Boyle's and Charles' Laws
      ii. Chapter 11 Vibrations and Waves
         1. Simple Harmonic Motion
         2. Hooke's Law
         3. Pendulum
         4. Springs and Masses

5. Properties of Waves
6. Wave Interactions

iii. Chapter 12 Sound

d. Fourth Nine Weeks
   i. Chapter 13 Light and Reflection
   ii. Chapter 14 Refraction
   iii. Chapter 15 Interference and Diffraction

II. AP Physics – Senior year
   a. First Nine Weeks
      i. Chapter 3 Two-Dimensional Motion and Vectors
      ii. Chapter 16 Electric Forces and Fields
      iii. Chapter 17 Electrical Energy and Current
   b. Second Nine Weeks
      i. Chapter 18 Circuits and Circuit Elements
      ii. Chapter 19 Magnetism
      iii. Chapter 20 Electromagnetic Induction
   c. Third Nine Weeks
      i. Chapter 21 Atomic Physics
      ii. Advanced Topics
         1. The Equivalence of Mass and Energy
         2. deBroglie Waves
      iii. Chapter 22 Subatomic Physics
      iv. Chapter 9 Heat
   d. Fourth Nine Weeks
      i. Chapter 10 Thermodynamics
      ii. Advanced Topics
         1. Properties of Gases
         2. Fluid Pressure
         3. The Doppler Effect and the Big Bang
      iii. Review of all Physics 1 topics for AP Exam in May
      iv. After exam topics of student interest for example Relativity, Advanced Electronics or Personal Investigations

If adjustments to time table need to be made, chapter 8 on Fluid Mechanics can be moved to the AP class as well as chapters 15, 14 or even 13 in the wave section. The AP class can pick up the slack in the following year.

4) Bibliographic Citations

Main textbook
Serway, & Faughn. Holt Physics. Holt, Rinehart and Winston 2006.

Supplemental textbooks
Giancoli. Physics. Prentice Hall. 1995. 4th edition.

Mooney. AP Advantage: Physics B. Peoples Publishing Group. 2005.

Obermiller. Vector Basics. J. Weston Walsh. 1993.

Laboratory Manuals
Griffith. Science Workshop. Pasco Scientific. 1996. 1st edition.

Goodwin. Practice Physics Labs. J. Weston Walsh. 1990.

Serway, & Faughn. Holt Physics lab manuals. Holt, Rinehart and Winston 2006

Trinklein. Modern Physics Laboratory experiments. Holt, Rinehart and Winston 1990.

5) Laboratory Activities

In both Physics 1 and AP Physics students perform many laboratory experiments. All of them are hands-on using real objects and none of them are virtual labs. These investigations require students to apply various measuring and observation skills as well as writing a lab report. A significant portion of these procedures uses Pasco interface technology to record measurements with electronic sensors. Quite often in these computer interface labs the data is displayed as a graph and the students have to interpret the data shown.

Most investigations involve students working in pairs although each student writes his or her own lab report. Students produce these formal lab reports for almost all of these procedures summarizing the following:

Purpose/Problem/Question
Hypothesis (Each student formulates one prior to performing the investigation)
Experimental Procedure
Data/Observations/Data Analysis
Sample Calculations
Post Lab Analysis Questions
Conclusion (Students evaluate if their hypothesis is supported or refuted by the lab results)

At least half of these investigations are inquiry based labs in which students are not given specific instructions; rather they are given a problem to solve or a question to answer, and a list of materials to use. Then they create their own procedure to find a solution to the problem/question making measurements and gathering data that will justify their solution. Often, students are asked to represent this data in the form of a graph. As usual students are required to write a lab report as described above and as usual they are asked to draw conclusions based on their observations and to give evidence from the data that supports their conclusions.

Below is a list of lab procedures that students perform.

1) Chapter 1 The Science of Physics
    a. The Circumference – Diameter Ratio of a Circle
    b. Physics and Measurement
    c. The Inertial Pendulum
2) Chapter 2 Motion in One Dimension
    a. Understanding Motion 1 – Position and Time
    b. Understanding Motion 2 – Velocity and Time
    c. Measuring Time
    d. Acceleration of a Freely Falling Picket Fence
3) Chapter 3 Two-Dimensional Motion and Vectors
    a. Computer Aided Instruction Module involving trigonometric functions
    b. Vector Treasure Hunt
    c. Rope Vectors
    d. Composition of Forces
    e. Acceleration on An Incline
    f. Velocity of a Projectile
4) Chapter 4 Forces and the Laws of Motion
    a. Discovering Newton's Laws
    b. Acceleration and Newton's Second Law
    c. Acceleration of a Cart
    d. Newton's Second Law – Constant Force
    e. Newton's Second Law – The Push and Pull of a Cart
    f. Coefficient of Sliding Friction
5) Chapter 5 Work and Energy
    a. Exploring Work and Energy
    b. Conservation of Energy: Potential into Kinetic
    c. Power
    d. Elastic Potential Energy
6) Chapter 6 Momentum and Collisions
    a. Collision – Impulse and Momentum
    b. HO Train Cars and Conservation of Momentum
7) Chapter 7 Circular Motion and Gravitation
    a. Centripetal Force
    b. Machines and Efficiency
8) Chapter 8 Fluid Mechanics
9) Chapter 9 Heat

    a. Coefficient of Linear Expansion
    b. Specific Heat
    c. Electric Equivalent of Heat
10) Chapter 10 Thermodynamics
11) Chapter 11 Vibration and Waves
    a. Simple Harmonic Motion of a Pendulum
    b. Springs and Masses
12) Chapter 12 Sound
    a. Using an Echo to Find the Speed of Sound
    b. Resonance: The Speed of Sound
    c. Waves in Strings
13) Chapter 13 Light and Reflection
    a. Photometry
    b. Plane Mirrors
14) Chapter 14 Refraction
    a. Index of Refraction of Glass
    b. Converging Lenses
15) Chapter 15 Interference and Diffraction
    a. Wavelength by Diffraction
16) Chapter 16 Electric Forces and Fields
    a. Electrostatics
    b. Drawing Magnetic Fields
17) Chapter 17 Electrical Energy and Current
    a. Measurement of Resistance: Voltmeter-Ammeter Method
    b. Measurement of Resistance: Wheatstone Bridge Method
18) Chapter 18 Circuits and Circuit Elements
    a. Resistors in Series and in Parallel
19) Chapter 19 Magnetism
    a. Magnetic Field About a Conductor
20) Chapter 20 Electromagnetic Induction
    a. Electromagnetic Induction
    b. Induction – Magnet Through a Coil
    c. The Electric Motor
21) Chapter 21 Atomic Physics
22) Chapter 22 Subatomic Physics

6) Instructional Modes

There are various modes of instruction used in this course. Demonstrations, Lecture, Question/Answer and laboratory exercises are among the most common ones. Each year more inquiry and discovery lessons are added to the curriculum while the amount of lecture is reduced. One type of lesson that is very effective is the Interactive Lecture Demonstration. Here students follow an eight step process of formulating hypotheses and testing them about a specific real life demonstration. This requires much planning, but is very

effective. Students are also given time to work in their base groups. This can be for projects, or even daily homework as the material leads.

7) Problem Assignments

Problems given to students come from the textbooks, released AP Exams and other worksheets designed by the instructor. An orderly problem-solving process is stressed to enable students to find solutions to all problems that they may encounter. This process is demonstrated in every part of the material and the students are held accountable for on their exams. Real life problem based learning assignments are also given. Students are also required to build a number of small vehicles that are to accomplish certain tasks.

8) Evaluation

Students are tested at the end of every unit with some quizzes given in between. Test consists of both multiple choice and free-response questions similar to AP exams. Students are allowed to use calculators. There are two cumulative exams given in class each year, one at the midterm and one final. Students are also strongly encouraged to take the AP Physics B exam in May. Laboratory reports, homework and project scores are combined with the test/quiz grades to give an overall grade for the course.