Advanced Placement Physics 1 Syllabus

Instructors: Dwight Daugherty

Texts: Physics, Jerry Wilson, Anthony Buffa
AP Physics 1 Study Guide (Princeton AP Chemistry)

Prerequisite: B or above in Algebra II, outstanding math skills in general and concurrent enrollment or finished pre-Cal/trig with a B or above. Instructor approval may be granted for exceptional cases.

Materials: Students should bring a scientific calculator, preferably a *TI graphing calculator, a class notebook, and a pen or pencil to class every day*.

Class Format: Advanced Placement Physics 1 is intended to be a course for science majors in college. It will require an extended commitment outside of class. You can expect to study approximately 2 hours per week outside of class to earn a decent grade in this course.

The course introduces students to five major disciplines of physics: mechanics, thermodynamics, waves, electromagnetism and quantum mechanics. The class has been designed and will be taught with the goals of :
1. building a solid conceptual base through laboratory investigations, demonstrations and collaborative activities.
2. improving analytical skills through the constant application of concepts to a variety of challenges and problems.
3. familiarizing students with and preparing students for the Advanced Placement Physics B exam through frequent exposure to similar test conditions, including two full length exams.

The school year starts in the middle of August and ends in the end of May, so there is little time left after the AP exam. Remaining times is spent on topics of interest. Generally we choose quantum physics and/or special relativity.
Within the daily context of the class, students are grouped into peer groups of four per unit. These students are selected for personal compatibility and ability level, with various abilities teamed together. Group work, peer tutoring and hands on activities are heavily emphasized. Demos are used but primarily in the context of showing a new procedure for students to follow. Our labs are placed throughout the instructional year, specifically during the course of study for that specific topic. I use laptops and computer based labs extensively, with Vernier LabQuest's and associated probes and sensors. I generally do not use cookbook lab handouts. Instead I prefer to begin with the presentation of a question or problem. For example, "How could we determine the acceleration of a free falling object?" Students are engaged in a guided discussion with the instructor as well as their peer lab groups to formulate a procedure to answer the question or solve the problem. They are then presented with an assortment of equipment and supplies and asked to design and carry out an experiment to test their hypothesis. They make observations, collect data, manipulate the data (if necessary) and then form conclusions. Each experiment requires a written report, kept in an organized lab notebook and stored in electronic

format on a dedicated flash drive. This facilitates the frequent request for proof of labs received from colleges when students enroll.

Grading: The course grade will be entirely dependent upon quizzes and tests. Most of these will be graded in class. Labs and occasional assignments will be offered for credit as well , however you must be prepared to "stand and deliver" with the physics content. Tests will be timed and no extra time is allowed.
Your grade will be determined by a simple total points approach.

Homework: Students are expected to complete homework assignments on your own. Solutions will be posted either on the web site or in class and students are responsible for reviewing this material. Many homework problems are similar to ones that have appeared on past AP exams. Generally homework will receive no credit as solutions will already have been posted and its sole purpose is to prepare you for the tests.

Labs: Laboratory investigations and activities are an important part of a physics education. To know physics is to do physics. There is an increasing emphasis on laboratory setups and error analysis on the AP exam. Students are expected to complete lab write-ups according to guidelines that will be explained. Students are expected to follow all safety guidelines outlined in the Lab. Late labs will be penalized one grade per day late up to five days, after which a zero will be recorded.

Tests: Exams will be given approximately every other week and will be mostly in AP format (half multiple choice, half free response). Students will complete 2 full-length AP exams before the end of the course.

Extra Help: Because of the accelerated nature of the course, it is imperative that students come in for help as soon as possible and not wait until the day of or before an exam. I will post available hours when the class meets and determines the most viable time for these help session.

Absences: Due to the advanced nature of the course, regular attendance is important. Students should
take initiative if absent including sending work in with a fellow student if due, obtaining any assignments from the web site and completing work in advance of returning to class. Make up labs and tests are scheduled at the instructors convenience.

Web presence: To maintain contact we will use my AP Physics Facebook group page to trace classroom events and assignments.

Email: The best way to contact me is through my email teach5460@gmail.com or via cell at 501-281-6957.

**Schedule:**
**Semester One:**
**Unit One: Review, Kinematics in One and Two Dimensions**
**Estimated Time:7** weeks
**Corresponding Textbook Chapter(s): 1, 2 ,3**

Topics:
review and discussion of summer work
measurement review
significant figures review
scalar vs. vector quantities
working with vectors
generating and analyzing graphs
motion in one dimension
distance and displacement
speed and velocity
acceleration
falling objects
constant acceleration equations
motion in two dimensions
projectile motion
introduction to circular motion

**Labs:**
How can you find the resultant, displacement, and velocity of a battery operated car
Determine how to measure final velocity and acceleration of a Cart on a Ramp
How do you find the final velocity of falling objects
Using your potato gun, determine the height and initial velocity of a projectile.

**Unit Two: Forces and Newton's Laws of Motion**
**Estimated Time:** 4 weeks
**Corresponding Textbook Chapter(s):** 4

Topics:
Newton's Laws of Motion
First Law
Second Law
Third Law
applications
weight vs. mass
normal force
friction
forces applied at an angle

tension
equilibrium situations
non-equilibrium situations

**Labs:**
How does mass affect acceleration (vernier lab with sensors)
Determine the coefficient of kinetic friction on a ramp using force sensors
Find the tension in a string

**Unit Three: Circular and Rotational Motion and Simple Harmonic Motion**
**Estimated Time:** 6 weeks
**Corresponding Textbook Chapter(s): 7,8**

Topics:
uniform circular motion
centripetal acceleration and force
vertical circular motion
satellites
Kepler's Laws
angular velocity and acceleration
tangential vs. angular velocity
center of gravity
torque
simple harmonic motion
pendulums
properties
energy
springs
properties
energy
Hooke's Law
gravitational force

**Labs:**
Find the relationship between radius, centripetal force, and tangential velocity
Find the mass of a meter stick using torque
Determine the period of a pendulum
Determining and comparing Hooke's Constant
Find the Earth's mass with a pendulum

**Unit Four: Work, Energy, and Momentum**
**Estimated Time:** 5 weeks
**Corresponding Textbook Chapter(s): 5, 6**

Topics:
work-energy theorem
applications
conservation of energy
applications
conservative vs. non-conservative forces
power
impulse and momentum
conservation of momentum
elastic and non-elastic collisions
angular momentum
conservation

**Labs:**
Is Energy Conserved with a Cart on a Ramp?
Determine what , if anything is (momentum and/or energy) conserved in elastic and non-elastic collisions

kinetic theory
speed of gas molecules
PV diagrams
thermodynamics
laws of thermodynamics
entropy
heat engines
efficiency
Carnot cycle
energy resources

**Labs:**
What determines the pressure in a fluid
How can you measure the rate of flow of a fluid abnd what factors affect it?
Determine how the specific heat of various metals differ.
Explore thermal expansion
What factors affect the values of R ( the gas constant)
What happens when we change and vary volume, pressure, and temperature

**Unit Six: Electricity and Magnetism**
**Estimated Time:** 6 weeks
**Corresponding Textbook Chapter(s): 15,16,17,18,19,20**

Topics:
static electricity
electric fields
electric forces
Coulomb’s Law
potential
conductors vs. insulators
Gauss' Law
capacitors
current and circuits
current
resistance
Ohm's Law
power
direct vs. alternating current
direct current circuits
series vs. parallel circuits
current and voltage
batteries
capacitors
magnetism
magnetic fields
magnetic forces
magnetic fields and current
Ampere's Law
induced current
flux
Faraday's Law
Lenz’s Law
electric generators

**Labs:**
What is static electricity
Compare parallel and series circuits
What are the use of capacitors in circuits
How does electromagnetic induction make generators and motors function?
Modeling a Wind Turbine

**Unit 9: AP Exam Review**
A minimum of four weeks will be devoted to a general review and exam preparation.