AP Physics 1 Syllabus
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Description

Advanced Placement Physics 1 is designed to closely match a typical one-semester introductory college physics course. The AP Physics program is based on standards set forth by the College Board which encompass and surpass NGSS standards. The designation "1" means that this course is Algebra-based (as opposed to requiring calculus) and that it will align with a first-semester college course. Topics covered include Newtonian mechanics, energy and momentum, mechanical waves and an introduction to DC circuits. The course will be taught using a college-level textbook and with more rigor than a regular high school physics class. It will also include college-level laboratory exercises.

Notes:

- Students planning to major in Engineering or a physical science will almost certainly be required to take a physics class which is taught using calculus; however this course will provide them a strong background in the general concepts necessary for success in a more math-intensive course.

A college physics course differs significantly from the usual high school course in respect to the textbook used, the range and depth of topics covered, the laboratory work done by students, and the time and effort required. Although much of the content will be presented in class, students will be expected and required to cover additional materials on their own.

The primary emphasis of the course is on developing an understanding of concepts; to gain confidence applying several physical concepts at once in order to solve a problem; and personal experience in scientific inquiry.

Students in AP Physics will only succeed if they appreciate that this course will be taught at the college level and will be very challenging. Students should be prepared to spend a minimum of 1-2 hours of study time per class period.

It is important to remember that you are in control of your success in this class. You are expected to prepare for class or lab each day, take responsibility for your actions, act in a respectful manner, and actively participate in class discussions and labs.

Textbook and Resources

Textbook: Physics – James S. Walker – 4th Edition
Online Resources:

- College Board website: apcentral.collegeboard.com – find sample test questions and answers
- Online Simulations: phet.colorado.edu www.simbucket.com
- Online tutorials and simulations: www.physicsclassroom.com

Required Materials

- Notebook or binder for class notes
- Scientific Calculator (graphing not necessary)
- Pen or pencil
- Notebook paper
- Colored pencils (suggested)

Course Pacing

We will cover roughly 1 chapter per 2 weeks, depending on the depth of the material. Students may be expected to cover additional chapters by self-study as assigned.

Students are expected to be actively responsible for their own learning and to advocate their needs.

Tentative Course Outline (subject to change)

First Semester (16 weeks)

I. Unit 1: Kinematics (4 weeks)
- **A.** Science Reasoning & Graphical Models
- **B.** Kinematics in One Dimension
- **C.** Kinematics in Two Dimensions

II. Unit 2: Dynamics (5 weeks)
- **A.** Forces and Newton's Laws of Motion

III. Unit 3: Impulse, Momentum, and Conservation of Momentum (2 weeks)
- **A.** Dynamics of Uniform Circular Motion Chap. 5
- **B.** Gravitation

IV. Unit 4: Energy and Conservation of Energy (5 weeks)
- **A.** Work and Energy

Second Semester (16 weeks)

V. Unit 5: Impulse, Momentum, and Conservation of Momentum (4 weeks)
- **A.** Impulse and Momentum Chap. 7

VI. Unit 6: Simple Harmonic Motion (2 weeks)
- **A.** Simple Harmonic Motion Chap. 10

VII. Unit 7: Rotational Motion and Conservation of Angular Momentum (4 weeks)
- **A.** Rotational Kinematics Chap. 8
- **B.** Rotational Dynamics Chap. 9

VIII. Unit 8: Mechanical Waves and Sound (2 weeks)
- **A.** Waves and Sound Chap. 16
- **B.** The Principle of Linear Superposition and Interference Phenomena Chap. 17

IX. Unit 9: Electrostatics (1 week)
- **A.** Electric Forces and Electric Fields Chap. 18

X. Unit 10: DC Circuits (3 weeks)
- **A.** Electric Circuits Chap. 20

Classroom Expectations

- Participate in class activities – lecture/discussions, labs etc. (no sleeping!)
- Come to class prepared – textbook, writing utensil, calculator, paper and equation sheet are required every day
- Be respectful of the classroom and everyone in it.
- Follow the rules as set forth in the THS student handbook

Consequences for Inappropriate Behavior:

- Verbal warning/asked to move
- After school detention and student conference
- Detention and student conference with parent contact
- Office referral and parent/guardian contact
- Removal from class and office referral

Grading

Since the purpose of the AP Physics course is to prepare for the national exam, calculation of grades will be predominantly based on exam performance. Course grades will be based on the following items and percentages:

• Tests and Quizzes	65%
• Labs	30%
• Homework and In-Class Assignments	5%

Homework

The purpose of homework in this class will generally be to practice concepts learned in class. Homework is usually assigned for an entire chapter at the beginning of the chapter and is due several days later. Homework assignments will be reviewed in class on the day they are due, therefore, except in the case of excused absence, late homework will not receive credit. The lowest homework grade from each quarter will be dropped.

Quizzes

One to two quizzes are generally given during each unit as a checkpoint for understanding.

Tests – AP Style

Tests will be administered periodically – generally one test per unit. In order to prepare for the AP test, all tests will be given in the "AP format" which includes a timed multiple-choice section followed by a timed free-response section. Each of these sections will be worth 50% of the grade. Tests will be mainly focused on recently covered information but may contain questions from previous chapters. Most questions on the AP test require the use of concepts from several different physics topics in order to complete the question. Tests throughout the year will model this approach

Labs

As per requirements of the College Board, a minimum of 12 college level labs will be performed throughout this course, and at least 25% of class time will be dedicated to lab work. Labs are intended to provide hands-on examples of the material covered in class and to familiarize students with formal laboratory practices and procedures. Formal lab reports will be required for approximately one lab per quarter. Students must keep an organized portfolio of all labs and lab reports as this is a requirement to receive college credit in some cases. **A separate binder for lab materials is recommended**.

Note about academic honesty:

Unless SPECIFICALLY stated in class or on an assignment worksheet, all laboratory work submitted for a grade is expected to be a student's own work. Students will work together on labs, but all written answers should be in each student's own words, and all graphs should be a student's own work. **Academic dishonesty on lab reports will be addressed according to the student handbook.**

Below is a sample of labs that will be performed throughout the year. Additional labs and experiments will be added.

1. Measurement uncertainty:
   - Students calculate the volume of the maximum sized 6-sided box that will fit into the classroom. Students must take all measurements with the proper precision and carry through uncertainty when calculating the volume. Class results are compared.
2. Calculation of acceleration due to gravity:
   - Students are given a variety of materials and measuring devices and must determine a way to calculate the acceleration due to gravity. Uncertainty calculations must also be done and the answer compared to the accepted

value. This lab is done just prior to the AP test as a review of lab skills and kinematics.

3. What is the mass?
   - As a class, students design a procedure to calculate the mass of an unknown object without the use of scales or balances. Uncertainty calculations are performed and students compare their answer to the actual value of the unknown mass.
4. Turning Point
   - Using conservation of energy along with circular motion concepts, students find the minimum distance at which a peg can be placed below a pendulum's point of attachment while still having the string remain taut as it circles the peg.
5. Ballistic Pendulum Lab
   - Using the concepts of conservation of momentum and conservation of energy, students predict the range of a ball launched from a ballistic pendulum (when the pendulum is moved out of the way). Using uncertainty calculations, students must create a target which encompasses a reasonable range of values and test whether the ball hits their target.
6. Simple Harmonic Motion
   - Using Hooke's Law, students calculate the spring constant of a spring. Students then calculate the spring constant using the period of the oscillating spring. These two values are compared and must coincide within the calculated uncertainty range.
7. Harmonics
   - A tuning fork is attached to a thin string from which various masses are hung. Standing wave patterns are formed on the string as the tension is changed and used to calculate the linear density of the string.

8. Ohm's Law
   - Students wire a simple circuit with a voltmeter and ammeter to collect data and verify Ohm's law. The internal resistances of the voltmeter and ammeter are then explored through additional measurements.

Safety

Safety in the science classroom is of the utmost importance. Students will be required to read and sign a safety contract before participating in lab activities. Students not following this contract will be subject to disciplinary action and may be removed from the activity.

Passes:

Students will be allowed to leave the classroom ONLY with a pass written and signed by the instructor in their own student agendas.

Absences

- Check with your instructor to find out what info you missed or to schedule a test/quiz/lab make-up. Feel free to use school e-mail to communicate about missed classes.

- Tests, quizzes and labs must be made up outside of normal class time.
- If you know in advance that you will be absent, you are required to see the instructor before your absence to collect work, and it will be due on the day you return.
- **Students who are absent the day before a test will still be required to take the test on the scheduled day**. Students who are absent for more than one day before the test should contact the teacher for information about the test. Each situation will be dealt with on a case-by-case basis.

Late Work

Homework that has already been reviewed in class will not be accepted for credit. Lab reports will be assessed a penalty of 10% per day late.

Extra Help

Physics is a challenging subject which builds upon itself. Therefore, I encourage students to see me for extra help if they begin to fall behind or do not understand a concept covered in class. Students are also encouraged to work together on problem-solving exercises, which means helping each other to UNDERSTAND the problem. Copying is considered academic dishonesty and will be addressed accordingly.

Students are expected to be responsible for their own learning and to advocate their needs.

"Science is a way of thinking much more than it is a body of knowledge"
- Carl Sagan

"I have no special talents. I am only passionately curious."
- Albert Einstein

"One thing is for certain: the more profoundly baffled you have been in your life, the more open your mind becomes to new ideas."
- Neil deGrasse Tyson

How to be Successful in AP Physics

Study Tips:

1. A physics textbook cannot be read the way you would read a novel! Begin by pre-reading the chapter; glance at the section headings, charts and tables in order to organize the material in your mind and stimulate your curiosity. This will make it easier to read the chapter and extract more information from it.
2. Be an active, not passive reader, by stopping frequently (at least every paragraph) and consider what you have just read. What is the concept being discussed? Put it in your own words (out loud or by writing it down); by doing so you are reprocessing and using the information presented in the text. Place a few key notes in you notebook; make sure these notes include all new terms and illustrative examples.
3. Become a note taker and not a note copier! Simply writing down what is written on the board is passive learning (it's a start, but is not as effective as it could be). To get the most out of taking lecture notes, do it in a systematic manner. Before class read the textbook material to be covered in lecture. You will then use class time more efficiently because you will learn more from the lecture, and you will be able to take better notes having been introduced to many of the concepts in the text. During lecture do not attempt to write down every word that is said; that approach is futile and unnecessary. Instead, focus on the major ideas.
4. Practice concepts by making your own practice problems which will allow you to rehearse and test yourself on the material.
5. Relate new information to other, related information.
6. Study with a friend in the class and at home! Take turns explaining the material to each other and working together on practice problems. Set up on-going study groups and meet at each other's home each week. Note: while working together on problems is encouraged, each student should work through every problem ON THEIR OWN before handing in an assignment. In fact, a good way to check your work is to work through problems separately, then compare answers to see if they deviate. This is also a good way to see a different approach to solving a problem, because in physics there is almost always more than one way to solve the problem.
7. There is too much new material in a physics class to be able to learn two weeks' worth of material the night before an exam! Review your text material and lecture notes daily so that you can avoid cramming at test time. Daily studying and practice helps problem-solving some more naturally.
8. Make the most of your time in lab by arriving fully prepared. AP Physics labs are too long and involved to try to perform without having thoroughly read over them the day before.

How Can Parents Help:

1. Quiet structured study time! Help your child to establish a study routine by setting up a quiet study area and a consistent quiet study time nightly. The routine will help them practice good study habits for college. Should the study area be their bedroom or a family area, like the dining room? That depends on your household and your child. If your child is self-motivated and can work steadily without supervision, then a quiet desk space in their bedroom would work well. However, if their bedroom is equipped with distractions like a stereo or TV, then this might not be conducive to concentrating on homework and the family area may work better.
2. Work on Physics EVERY night! For your child to stay up-to-date in this course they need to spend some time on physics every night. The ideal would be about one (1) hour per night or approximately six (6) hours per week. This would include textbook reading, lecture review, lab notebook assignments, practice problems, and test preparation. On weeks when they cannot devote that one hour on a weeknight, they should put in extra time on weekends to make up for it. On nights where they have minimal time, your child should at least review the day's lecture notes.
3. Support Study Groups! Encourage your child to arrange a study group with other students in the class. Each student will have different strengths and weaknesses in this course. In one unit, your child will be the teacher to other students and in a different unit they will be the student. Putting two or more heads together is always a benefit. You never learn something as well as when you have to explain it to someone else. However let me emphasize that, while study groups and cooperative effort are strongly encouraged; on final written work, all students are required to craft their own answers, and must have a completely uniquely worded answer for each question! Students should work through the complete problem on their own before handing in an assignment.
4. Use a Lifeline! Encourage your child to ask for help. I can generally stay after school any day for extra help. Also, all my AP students have my e-mail address and they can e-mail me for help at any time after school hours and I will make every effort to reply to them as soon as possible. Do not allow them to feel like they are intruding, I am here to help them understand and learn to love the subject of Physics as much as I do.
5. Don't Panic! Stick with it! Some parts of this course will come more easily than others. Encourage your child to work steadily and not to be discouraged. Success will build as they improve their critical thinking skills and their problem-solving ability through practice. This is a college course and they are working on more than learning physics; they are working on skills that they will use to succeed academically for years to come. Your child needs to work hard and work steadily and they will be rewarded in this course!