AP Physics Syllabus

Course Overview

Advanced Placement Physics B is an algebra-based course in general physics. It is equivalent to an introductory algebra-based university level physics course, whose syllabus has been designed by the College Board. The Physics class meets 5 times per week for 82 minutes each day, with an The major emphasis of the course is to understand the concepts of physics, and apply them along with formulae to solve problems. Laboratory experiments are done throughout reinforce the relationships and concepts currently being studied.

Text: Physics by Giancoli, 5th edition

Course Outline

The following is a course content outline with an approximate time line. The amount of time spent on each topic corresponds to the percentages of material on the exam, as given in the AP Physics Course Description.

I. Introduction (2 weeks)

Unit 1: Math and Data Review (2 weeks) A. Algebra/Trig Review

B. Data collection and analysis

1. Significant figures

2. Unit conversion

C. Vector addition

1. Graphical methods

2. Algebraic methods

II. Newtonian Mechanics (11 weeks)

Giancoli: Ch 1& 3

Unit 2: Kinematics (4 weeks) Giancoli: Ch 2, 3, & 5 A. Motion in One Dimension

1. Position-time and velocity-time graphs

2. Equations of motion under constant acceleration

B. Motion in two dimensions

1. Projectiles2. Circular motion

Unit 3: Newton's Laws of Motion (2 1⁄2 weeks) Giancoli: Ch 4 & 8 A. Static equilibrium (1st Law)

1. First condition – translational equilibrium

2. Second condition – rotational equilibrium (torque)

B. Dynamics of a single particle (2nd Law) C. Systems of two or more bodies (3rd Law)

Unit 4: Work, Energy and Power (11⁄2 weeks)

A. Work and the work-energy theorem

B. Conservativeforcesandpotentialenergy

C. Conservationofenergy

D. Power

Giancoli: Ch 6

Unit 5: Systems of particles, linear momentum (1 week)

A. Impulse and momentum

B. Conservation of linear momentum, collisions

Giancoli: Ch 7

Unit 6: Oscillations and gravitation (2 weeks)

A. Simple harmonic motion

B. Mass on a spring

C. Pendulum and other oscillations

D. Newton's law of gravity

E. Kepler's Laws

Giancoli: Ch 11 & 5

III. Fluid Mechanics & Thermal Physics (6 weeks)

Unit 7: Fluid Mechanics (3 weeks) Giancoli: Ch 10 A. Density and pressure

1. Density and specific gravity

2. Pressure as a function of depth

3. Pascal's Law

B. Buoyancy–Archimedes'Principle C. FluidflowcontinuityD. Bernoulli's equation

Unit 8: Thermal Physics (3 weeks) Giancoli: Ch 13, 14 & 15 A. Temperature and heat

1. Mechanical equivalent of heat

2. Specific and latent heat

3. Heat transfer and thermal expansion

B. Kinetic Theory and Thermodynamics

1. Ideal gases

a. Kinetic model

b. Ideal gas law

2. Laws of thermodynamics

a. First Law (PV diagrams)

b. Second Law (heat engines)

IV. Electricity and Magnetism (7 weeks)

Unit 9. Electrostatics (1½ weeks) Giancoli: Ch 16

A. Charge, field and potential

B. Coulomb'sLaw and point charge field and potential

Unit 10. Conductors and Capacitors (1 week) Giancoli: Ch 16 & 17
A. Electrostatics with conductors

B. Capacitors–parallel plates

Unit 11. Electric Circuits (2 weeks) Giancoli: Ch 18 & 19
A. Current, resistance, power

B. Direct current circuits

C. Steady state capacitors in circuits

Unit 12. Magnetostatics (1 week) Giancoli: Ch 20

A. Forces on moving charges in magnetic fields

B. Forcesoncurrentcarryingwiresinmagneticfields

C. Fields of long current carrying wires

Unit 13. Electromagnetic induction and waves (1 1⁄2 weeks) Giancoli: Ch 21

V. Waves and Optics (4 1⁄2 weeks)

Unit 14. Wave Motion (sound and physical optics) (3 weeks) Giancoli: Ch 11 & 22

A. Properties of traveling and standing waves

B. Doppler effect

C. Superposition

D. Interference and diffraction

E. Dispersion of light and the electromagnetic spectrum

Unit 15. Geometric Optics (11⁄2 weeks) Giancoli: Ch 23 A. Reflection and refraction

B. Mirrors C. Lenses

VI. Modern Physics (3 weeks)

Unit 16. Atomic physics and quantum effects (2 weeks) A. Alpha particle scattering and Rutherford model B. PhotonsandthephotoelectriceffectC. Comptoneffect

D. Bohr model (atomic energy levels)

Giancoli: Ch 27

E. Wave particle duality

Unit 17. Nuclear physics (1 week) Giancoli: Ch 30 A. Atomic mass, mass number, atomic number B. MassdefectandnuclearbindingenergyC. Nuclearprocessesandradioactivedecay

a. α decay

b. β decay

c. γ decay

D. Mass-energy equivalence

Laboratory The labs are strategically placed throughout the year where they best fit into the curriculum, using traditional methods. The labs are made up of all three varieties, ranging from teacher directer to limited investigations to open-ended investigations. For the latter two types, they are presented with an objective or question, led in a class discussion to formulate a hypothesis concerning the problem, and left to use the assortment of materials provided to design an experiment and test the hypothesis. At the conclusion of the lab, a report is written

which includes the purpose, background, hypothesis, procedure, data, necessary calculations and graphs, analysis, and conclusion. Errors that occurred will also be included with the report.

The following is a list of our potential labs :

1. Measuring Temperature
2. Analyzing Motion
3. Addition of Force Vectors: Limited Investigation
4. Accelerated Motion
5. Acceleration Due to Gravity
6. Projectile Motion
7. Range of a Projectile
8. Circular Motion
9. Friction
10. Torques
11. Conservation of Energy
12. Conservation of Momentum
13. Hooke's Law: Limited Investigation
14. Archimedes Principle
15. Specific Heat
16. Investigating Static Electricity
17. Ohm's Law
18. Series Resistance

19. The Nature of Magnetism

20. Standing Waves on a String

21. Resonance in an Open Tube

22. Intensity of Light

23. Snell's Law

24. Image Formation by Spherical Mirrors and Lenses

25. Double-Slit Interference

26. Photoelectric Effect

Classes

Classes generally consist of a 25 minute concept review of their reading assignment including applications and demonstrations, followed by 60 minutes of applied problem solving. The problems may be reviewing ones that were assigned for homework on a previous day, or working in class on ones that are assigned for the following day. Students will generally be allowed to work in pairs to help each other, as well as getting individual help from the instructor. A systematic approach to problem solving is modeled and encouraged throughout the year.

Evaluation

The students will be evaluated in the following areas:

1. Tests 40%

2. Quizzes 10%

3. Labs 25%

4. Classwork/Homework 25%

Tests will consist of both of multiple choice questions and free-response problems. Lab based questions will also be included. Students are permitted to use AP reference tables and calculators.