

AP Physics Course Syllabus:

Advanced Placement Physics is a year long course that prepares students to take the AP Physics B exam in May of the school year. Students are expected to be excellent math students and should be prepared to work independently. Students are also encouraged to form study teams. Generally speaking the class consists of 4 x 50 minute lectures a week and 1x50 minute period devoted to lab work or interactive demonstrations. Grades are based upon homework, test and quizzes and lab work.

Grading breakdown:

Homework: 40% of grade. Homework is split into book work which includes reading, definition of pertinent terms and problems and teacher designed worksheets which are used to assess specific areas.

Lab Work: 10% of grade. Labs are generally open ended where students are provided with a general procedure, a set of equipment and they are expected to determine what data to collect, how to collect it and how to analyze it. Once each semester student will be required to produce a formal lab report.

Tests and Quizzes: 50% of grade. After each unit students will be quizzed. Quizzes are free response and are about 20% of the overall class grade. Tests are multiple choice and given at midterm and final time of each quarter they account for 30% of the overall grade. For tests student may use their constant sheet and a writing utensil. For quizzes student are allowed to use calculators and the AP Physics B equation list.

By the end of the course student will be expected to;
Read, understand and interpret physical data.

Utilize the scientific method to solve physics related problems.

Use mathematical reasoning to correctly interpret physics related problems.

Perform experiments and analyze and understand the resulting data in a correct and relevant manner.

Textbook: Serway, Raymond A., and Jerry S. Faughn. *College Physics*. Pacific Grove, CA: Brooks/Cole Thomson Learning.

Course outline below (Suggested unit lengths are approximations)

Unit 1: Introduction (3 days)

Subjects:

Converting Units
Significant Figures
Units of Measurement

Assessments: Worksheet-practice conversion problems with significant figure use required, pretest (both teacher produced).

Labs: Significant figures and Measurement Lab; Goal- Students will refresh their knowledge of how significant figures and measurements are linked through a hands on approach. (1 period)

Unit 2: Kinematics (2 weeks)

Subjects:

Velocity and acceleration
Motion in One Dimension
Motion in Two Dimensions/Projectile Motion
Vectors
Equations of Motion – One and Two Dimensions
Freefall Motion

Assessments: Bookwork*, Free Response Quiz on Motion.

Labs: Vectors; Goal- Students will use force table to prove forces are vectors. (2 periods)

Calculation of “g” demo lab; Goal- students will determine the acceleration due to gravity. (1/2 period).

Unit 3: Newton’s Laws (1.5 week)

Subjects:

Newton’s First Law
Newton’s Second Law
Forces in Two Dimensions
Forces in Balance
Free Body Diagrams
Newton’s Third Law

Assessments: Bookwork*, Free Response Quiz on Newton’s Laws, Multiple choice test on everything covered.

Labs: Inclined Plane; Goal- Students will learn how the coefficient of friction and an inclined plane determine the acceleration of an object down the plane . (1 period)

Atwood's Machines; Goal-Students will learn how simple machines and force relate. (1 period)

Unit 4: Work and Energy (1.5 weeks)

Subjects:

Kinetic and Potential Energy
Work & Work-Energy Theorem
Gravity & Work
Conservation of Energy
Hooke's Law
Pendulum
Power
Video- Rollercoaster's

Assessments: Bookwork*, Quiz on Work/energy

Labs: Hot Wheels Loop to Loop; Goal- Students will learn about the relationship between energy, position and velocity. (1 Period)

Unit 5: Thermodynamics and Heat (2 weeks)

Subjects:

Temperature
Heat
Specific Heat
Latent Heat
Equilibrium
Thermal Expansion
Ideal Gases
Gas Laws
Laws of Thermodynamics
First Law of Thermodynamics
Second Law of Thermodynamics
Entropy

Assessment: Bookwork*, Multiple Choice Final Exam.

Labs: Specific Heat; calculate the specific heat of several metals. (1period)
Absolute Zero Lab; Goal- Students will calculate absolute zero from pressure/temperature data. (1 period)

Unit 6: Momentum (1 week)

Subjects:

Center of Mass
Impulse & Momentum
Momentum form of the 2nd Law
Elastic Collisions
Inelastic Collisions

Assessments: Bookwork*, Collision of a car Worksheet, FRQ Quiz.

Labs: Collisions of Carts; Goal- Students will investigate; the collisions between spring equipped carts and the conservation of momentum. (1 period)

Unit 7: Circular Motion, Rotational Motion and Gravitation (3 weeks)

Subjects:

- Uniform Circular Motion
- Frequency & Period
- Centripetal Acceleration
- Torque
- Simple Harmonic Motion
- Harmonic Oscillator
- Hooke's Law
- Pendulum
- Resonance
- Newton's Law of Gravitation
- Gravitational Field
- Keplers Law
- Gravitational Force
- Planetary Motion
- Escape Velocity
- Video; "Mechanical Universe; Universal Gravitation"
- Video; "Mechanical Universe; Keplers Laws"

Assessments: Bookwork*, Test on Circular motion and momentum MC.

Labs: Calculating "g" using a Pendulum Lab; Goal- Student will calculate the acceleration due to gravity using a pendulum and learn about pendulum motion. (1 Period)

Unit 8: Fluids (1 week)

Subjects:

- Hydrostatic Pressure
- Density
- Specific Gravity
- Pressure
- Measuring Pressure
- Pascal's Principle
- Buoyancy
- Archimedes' Principle
- Bernoulli's Equation

Assessments: Bookwork*

Labs: Specific gravity of an object; Goal- Students will learn about specific Gravity and its relation to the density of water (1 period)

Unit 9: Waves and Optics (3 weeks)

Subjects:

Wave Types
Parts of waves
Interference
Diffraction
Refraction
Reflection
Double Slit Experiment
Diffraction Grating
E-M Spectrum
Polarization
E-M Waves
Total Internal Reflection
Index of Refraction
Lenses and Mirrors
Resonance
Doppler Effect
Video Disc- Tacoma Narrows Bridge

Assessments: Bookwork*,

Labs: Lenses and Mirrors; Goal- Students will investigate how mirrors and lenses work (optics benches). (2 periods)

Critical Angle Demo Lab; Goal- Student will calculate the critical angle for water. (1/2 period)

Speed of Light Demo Lab; Goal- Student will calculate the speed of light in air. (1/2 period)

Beats of sound waves Demo Lab. (1/2 period)

Resonance boxes Demo Lab. (1/2 Period)

Unit 10: Electrostatics (2 week)

Subjects:

Coulomb's Law
Conductors and Insulators
Electric Fields
Parallel Plates
Charges in Conductors
Conducting Sphere
Charged Spheres
Induced Charge
DOP
Millikan Oil Drop Experiment Online demonstration

Assessments: Bookwork*,

Labs: Static Electricity; Van de Graff Generator Demonstration. (1/2 period)

Coulombs Law; Goal- Students will use coulombs law to calculate the number of excess electrons on a pith ball. (1 period)

Unit 11: Electricity (2 weeks)

Subjects:

- Capacitors
- Capacitance
- Parallel Plate Capacitor
- Adjustable Capacitor
- Energy Storage in Capacitors
- Current, Resistance, Power
- Electric Current
- Resistance, Resistivity
- Electric Field in a Conductor
- Power
- EMF
- Series Circuits
- Parallel Circuits
- Ohm's Law
- Kirchhoff's Loop Rule
- Kirchhoff's Junction Rule

Assessments: Bookwork*, Practical quiz; building a circuit from a circuit diagram.

Labs: Electric Circuit Building using Planets Kits; Goal- Students will learn about the function of electric circuits and components. (3 periods)
Reading a resistor. (1/2 period)

Unit 12: Electromagnetism (2 weeks)

Subjects:

- Magnetic Fields
- Magnetic Field Lines
- Forces on Moving Charges
- Right Hand Rules
- Forces on Current-carrying Wires in Magnetic Fields
- Electromagnetic Induction
- Magnetic Flux
- Lenz Law
- Electric Generator

Assessments: Bookwork*

Labs: Deflection of a compass needle by a current carrying wire; Goal- Students will learn about the creation of a magnetic field from an electric current.
(½ period)
Electromagnet. (1 period)

Unit 13: Modern Physics (3 weeks)

Subjects:

Relativity
Lorentz Transformation
Photoelectric Effect
Electrons
Quantum
Photoelectric Effect
Compton Effect
Atomic Energy Levels
Bohr Atom
Energy Levels
Wave-particle Duality
De Broglie
Electron Diffraction
Nuclear Reactions
Radioactive Decay, ½ life
 $E=mc^2$
Binding Energy/mass defect
Nuclear Fusion
Nuclear Fission

Assessments: Bookwork*

Labs: Geiger counter, Demo Lab (1/2 period)

Unit 14: AP Test Review

Subjects: All previously covered units.

Assessments: Review Worksheets with book problems, terms, equations and practice free response questions.

*Book work consists of assigned reading, definition of terms and practice problems.