

# AP Physics B

## Syllabus

### Course Overview

This school is on an A/B block schedule. The AP Physics classes meet every other day for 90 minutes. Scheduled contact time is 135 hours per school year. Goals of the AP Physics B course are to

(1) read, understand and interpret physical information, (2) use mathematical reasoning in problem solving, and (3) perform experiments and interpret observed data.

Evidence of Curricular Requirement: **The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.**

### Text

PHYSICS by Cutnell & Johnson, 5<sup>th</sup> edition, Willey & Sons Publishing Company.

### Course Outline

The percentages listed in the following course outline were derived from those listed in the AP Physics Course Description for coverage on the AP Exam. The chapters listed relate to our textbook. The timeline is listed by classroom hours.

- I. Mechanics (47 classroom hours)
  - A. Kinematics..... 11%
    - 1. Motion in one dimension - Chapter 2
    - 2. Motion in two dimensions
      - (a) Projectile motion – Chapter 3
      - (b) Uniform circular motion – Chapter 5
      - (c) Torque – Chapter 9
      - (d) Angular motion and its conservation – Chapter 9
  - B. Newton’s Laws of Motion – Chapter 4 .....9%
    - 1. Static equilibrium – First law
    - 2. Dynamics of a single particle – Second law
    - 3. Systems of two or more bodies – Third law
  - C. Work, energy and power – Chapter 6 .....5%
    - 1. Work and the work-energy theorem
    - 2. Conservative forces and potential energy
    - 3. Conservation of energy
    - 4. Power
  - D. Systems of particles, linear momentum – Chapter 7 .....4%
    - 1. Impulse and momentum
    - 2. Conservation of linear momentum, collisions
  - E. Oscillations and gravitation – Chapters 4 and 10 .....6%
    - 1. Simple harmonic motion
    - 2. Mass on a spring
    - 3. Pendulum and other oscillations
    - 4. Newton’s law of gravity

Evidence of Curricular Requirement: **Newtonian Mechanics**

II. Heat, Kinetic Energy and Thermodynamics, Fluids (14 classroom hours)

A. Temperature and heat – Chapter 12 .....3%

1. Mechanical equivalent of heat
2. Specific and latent heat
3. Heat transfer and thermal expansion

B. Kinetic Theory and thermodynamics .....4%

1. Ideal gases – Chapter 14
  - (a) Kinetic model
  - (b) Ideal gas law
2. Laws of thermodynamics – Chapter 15
  - (a) First law
  - (b) Second law

C. Fluid Mechanics – Chapter 11.....3%

1. Buoyancy and Archimedes Principle
2. Pascal’s Principle
3. Bernoulli’s Principle

Evidence of curricular requirement:  
**Fluid Mechanics and Thermal Physics**

III. Electricity and Magnetism (34 classroom hours)

A. Electrostatics – Chapter 18 .....5%

1. Charge, field and potential
2. Coulomb’s law and point charge field potential

B. Conductors and capacitors – Chapter 19.....4%

1. Electrostatics with conductors
2. Capacitors – parallel plates

C. Electric circuits – Chapter 20.....7%

1. Current, resistance and power
2. Direct current circuits

D. Magnetostatics – Chapter 21.....4%

E. Electromagnetic induction and waves – Chapter 22.....5%

Evidence of Curricular Requirement:  
**Electricity and Magnetism**

IV. Waves and Optics (20 classroom hours)

A. Wave motion .....10%

1. Properties of traveling and standing waves - Chapter 16
2. Doppler Effect – Chapter 16
3. Superposition – Chapter 16
4. Interference and diffraction – Chapter 27

B. Geometric Optics – Chapter 25 .....5%

1. Reflection and refraction
2. Mirrors
3. Lenses

Evidence of Curricular Requirement:  
**Waves and Optics**

V. Modern Physics (20 classroom hours)

A. Atomic physics – Chapters 29 and 30 [C5] .....10%

1. Alpha particle scattering and Rutherford model
2. Protons and the photoelectric effect
3. Bohr model
4. Wave particle duality

B. Nuclear Physics – Chapter 31 .....5%

Evidence of Curricular Requirement:  
**Atomic and Nuclear Physics**

1. Radioactivity and half-life
2. Nuclear reactions
3. Mass and energy effects

## Laboratory

An attempt is made so that labs are completed and placed throughout the instructional year when they are appropriate and enhance the curriculum. For some labs TI-83 calculators may be used along with Vernier Lab Probes and Logger Pro software. In addition, some labs are done using physics materials and equipment which do not require computers.

Typically, labs will begin with posing a question or problem which relates to the instructional concept being taught. For example: “Given wires, bulbs, batteries, and switches, what is the arrangement which would give maximum current?” Based on given background information and a guided discussion, students are required to formulate a hypothesis, design and carry out an experiment, collect data, make observations, answer questions, and develop an appropriate conclusion. Experiments require a written report which is kept in an organized lab notebook.

Evidence of Curricular Requirement: **The course utilizes guided inquiry and student centered learning to foster the development of critical thinking skills**

The following is a list of labs which may be done during the school year. Labs with parenthesis (i.e. Graph Matching (Lab 1)) are direct or modified versions of pre arranged labs from Physics With Computers, Physics Experiments using Vernier Sensors, 3<sup>rd</sup> Ed. Labs without parenthesis (i.e. Determining Centripetal Force) are adapted from former AP test questions, and are given with materials and a minimum amount of defined setup. Students are typically prompted and expected to “design” their own experiment to determine an answer.

- I. I. Mechanics
  - A. Graph Matching (Lab 1)
  - B. Static and Kinetic Friction (Lab 12)
  - C. Determining g on an Inclined Plane (Lab 4)
  - D. Determining Centripetal Force
  - E. Impulse and Momentum (Lab 20)

Evidence of Curricular Requirement: **The course includes a laboratory component comparable to college-level physics laboratories, with a minimum of 12 student-conducted laboratory investigations representing a variety of course topics. Each student should complete a lab notebook of lab reports.**

- II. Fluid Mechanics and Thermal Physics

A. Work and Energy (Lab18)

B. Heat Transfer Lab

### III. Electricity and Magnetism

A. Series and Parallel (Lab26)

B. Creating / Finding Equipotential Lines

C. Capacitors (Lab 27)

### IV. Waves and Optics

A. Determining focal lengths of lenses and mirrors

B. Speed of Sound (Lab 24)

C. n Lab: determining the index of refraction of plastic and glass

**Evaluation:** A combination of unit tests, quizzes, lab reports and homework assignments are combined to reach an overall grade at the end of each of our schools four report card periods.

Tests:	50%
Homework:	20%
Labs:	10%
Classwork:	10%
Quizzes:	10%