# AP Physics C Syllabus

**Course Overview**

AP Physics C will meet for 90 minutes on block scheduling and for 45 minutes on regular scheduling. Class activities will include lecture, demonstration, problem solving sessions, and lab. On regular scheduling, the entire class period will be devoted to lab time when labs are scheduled. On A-B scheduling, 50 minutes will be scheduled for lab while the rest of the period may be used for other activities. Differential and integral calculus will be used throughout the course. It is recommended that students at least take AP Calculus concurrently; however, calculus concepts will be taught in AP Physics C on an "as needed" basis.

**AP Physics Text Book:**

*Physics for Scientist and Engineers a strategic approach* (3rd ed.) Knight, Pearson: Boston, Massachusetts, 2013.

In addition to the textbook, the web based program Mastering Physics will be used to supplement and reinforce instruction. Many of the homework assignments will be web based.

**Materials Required and Used:**

The AP Physics C Course will utilize computer based laboratory equipment and real time technology, such as the Pasco 750 Science Workshop and video analysis software. Students will have access to computers and the internet on a regular basis, if needed. In addition to advanced real time technology, some traditional labs will be used.

**Lab Procedure:**

Lab time will be 50 minutes for procedures. If needed in some cases, more time will be supplied. Students may be required to produce lab reports and documentation on their own time. Some labs will be student designed or developed, while others will be predesigned. Students will work in groups ranging from two to four students depending on class size. All students will be required to submit lab reports. Students planning to use the class as a lab credit should keep a lab portfolio for verification of college level lab work. Lab reports will include the following:

- a statement of the problem
- an hypothesis
- a procedure

- the data recorded
- graphs and data analysis
- a conclusion including error analysis

Some of the labs will involve problem solving to determine unknown variables or the effect of what manipulating one variable has on another variable. In many cases, the students will have access to a variety of lab equipment with no specific directions as to how to carry out the lab. It will be up to the students to develop a method to determine the unknown values or to test the effects of changing variables.

At the beginning of lab exercises, discussions will be held where the students will be asked to explain different phenomena relating to the current topic. Students will also be asked to try to counter this explanation if they do not agree with it. These discussions may be carried out utilizing digital media or 2 x 3 white boards to demonstrate visually the various concepts. After the collection and analysis of data occurs, theories will be revisited for continued discussion, at which time, a conclusion will be drawn. This conclusion will be compared to the actual scientific explanation. Finally, the students may be asked to explain any deviation from the actual explanation.

## Course Outline

| **Newtonian Mechanics** | **Topics** | | **Labs and Test** |
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| **(times are approximate and percent represents amount on the actual AP test)**<br><br>**3 weeks**<br>**18%** | A. Kinematics (including vectors, vector algebra, components of vectors, coordinate systems, displacement, velocity, and acceleration)<br>1. Motion in one dimension<br>2. Motion in two dimensions, including projectile motion and circular | **Chapters** | **Labs listed are a minimum and should comprise 20% of the course**<br><br>Kinematics and Graphing Lab<br><br>Projectile Motion Lab<br><br>Test 1 |
| **2 weeks**<br>**20%** | B. Newton's laws of motion<br>1. Static equilibrium (first law)<br>Including translational and rotational equilibrium<br>2. Dynamics of a single particle (second law)<br>3. Systems of two or more objects (third law) | 5-8 | Newton's 2nd Law Lab (Atwood style lab)<br><br>Newton's 3rd Law Lab (Dynamics Cart Tug-of-War)<br><br>Test 2 |

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| **2 weeks**<br>**14%** | C. Work, energy, power<br>1. Work and work—energy theorem<br>2. Forces and potential energy<br>Including gravity and springs<br>3. Conservation of energy<br>4. Power | 10-11 | Ballistic Pendulum Lab<br><br>Spring Cart on an Incline Lab<br><br>Test 3 |
| **2 weeks**<br>**12%** | D. Systems of particles, linear momentum<br>1. Center of mass<br>2. Impulse and momentum<br>3. Conservation of linear momentum, collisions<br>Including elastic and inelastic collision | 9 | Conservation of Momentum in Collisions Lab (elastics and inelastic)<br><br>Center of Mass Lab<br><br>Test 4 |
| **3 weeks**<br>**18%** | E . Rotational motion an static equilibrium<br>1 . Torque and rotational statics<br>2 . Rotational kinematics and dynamics<br>3 . Angular momentum and its conservation | 12 | Rotational Kinematics Lab<br><br>Moment of Inertia Lab<br><br>Torque Lab<br><br>Test 5 |
| **3 weeks**<br>**18%** | F. Oscillations and gravitation<br>1. Simple harmonic motion (dynamics and energy relationships)<br>2. Mass on a spring<br>3. Pendulum and other oscillations<br>4. Newton's law of gravity<br>5. Orbits of planets and satellites<br>a. Circular<br>b. General | 13-14 | Mass on a Spring Graphing Lab<br><br>Dynamics Cart Oscillation Lab<br><br>Test 6 |
| | **End of Newtonian Mechanics** | | |

| | **Electricity and Magnetism** | | |
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| **Electricity and Magnetism** | **Topics** | **Chapters** | **Labs, Assignments, and Test** |
| **2 weeks**<br>**30%** | A . Electrostatics<br>1 . Charge and Coulomb's law<br>2 . Electric field and electric potential (including<br>point charges)<br>3 . Gauss's law<br>4 . Fields and potentials of other charge distributions | 25-27 | Electrostatics Qualitative Lab<br><br>Gauss's Law Lab<br><br>Test 7 |
| **2 weeks**<br>**14%** | B . Conductors, capacitors, dielectrics<br>1 . Electrostatics with conductors<br>2 . Capacitors<br>a . Capacitance<br>b . Parallel plate<br>c . Spherical and cylindrical<br>3 . Dielectrics | 28-29 | Parallel Plate Capacitor Lab<br><br>Test 8 |
| **3 weeks**<br>**20%** | C . Electric circuits<br>1 . Current, resistance, power<br>2 . Steady-state direct current circuits with batteries and resistors only<br>3 . Capacitors in circuits<br>a . Steady state<br>b . Transients in RC circuits | 30-31 | DC Circuits Lab<br><br>RC Circuit Lab<br><br>Test 9 |
| **3 weeks**<br>**20%** | D . Magnetic Fields<br>1 . Forces on moving charges in magnetic fields<br>2 . Forces on current-carrying wires in magnetic fields<br>3 . Fields of long current-carrying wires<br>4 . Biot–Savart law and Ampere's law | 32, 34 | Magnetic Fields around a Current Carrying Wire Lab<br><br>Test 10 |

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| **3 weeks**<br>**16%** | E . Electromagnetism<br>1 . Electromagnetic induction (including Faraday's law and Lenz's law)<br>2 . Inductance (including lr and lc circuits)<br>3 . Maxwell's equations | 33 | Faraday Law Lab<br><br>Test 11 |