Welcome to AP Physics C

(A second year course in physics)

What is AP Physics C?

AP Physics C is a calculus based course in physics, and is designed very similarly to a first year engineering course that would be taught at the college level. The course is divided into two parts:

- Part I is all about Mechanics.
- Part II involves the study of Electricity and Magnetism.
- At the end of the year (May) you will have the opportunity to take Part I on Mechanics, Part II on Electricity and Magnetism, or both.

As a student in this course, you should have had some prior experience in physics either through Regents or Honors physics. In addition, you should have a reasonable grasp of the basic physics concepts you have already learned. Calculus is either a prerequisite or co-requisite for this course.

Course Goals:

1. Students will develop a basic knowledge of physics, including phenomenology, theories and techniques, concepts and general principles.
2. Students will develop skills in problem solving and critical thinking.
3. Students will develop an appreciation of the physical world and the discipline of physics, curiosity, creativity and reasoned skepticism.
4. Students will develop self-confidence and be successful on the AP Exam(s) in May.

Student Expectations and Teaching Strategies: A significant percentage of my notes have been prerecorded and uploaded into Edpuzzle. Edpuzzle allows me to embed questions that target understanding at various points throughout the lecture. Students should expect to take notes on a regular basis where Edpuzzle will be the platform to disseminate them. This will be especially important when going through derivations using calculus and problem solving. Therefore, a notebook or other suitable resource is highly advised. A graphing calculator is a necessity as opportunities may arise in which they may want to use the more advanced functions that they provide. In addition, students will be expected to use technology on a regular basis using lab equipment or in the analysis of their data. Such technology may include, but is not limited to, Excel, Google Sheets,

Vernier Logger Pro, etc. Lastly, all students will maintain an individual lab notebook throughout the year.

On a daily basis, students will be given the opportunity to answer AP questions from old exams, or similar type questions from other resources. In some cases, the problem will come from a demonstration. At these times, students will work in groups to answer these questions, in some cases using whiteboards to show their work. Students will be encouraged to work with each other as well as use other resources available to them, including myself as a facilitator, books, the Internet, etc.

Homework: Some homework will be assigned on a weekly basis using an Internet based service called WebAssign (www.webassign.net). This portion of the homework will use questions from your textbook. Other homework will be given in the form of AP type questions. Time permitting, students will be given an opportunity to work on their homework during class time.

Labs: Students will be required to keep a lab book for each laboratory investigation done in class. Students should expect to perform at least one hands on laboratory-based activity per week. The labs in this course are hands on and will target your abilities to collect and summarize data and make appropriate connections with concepts learned in this course. Lab books will be collected and graded on a periodic basis. Those lab books handed in after the due date will be marked down accordingly.

Quizzes and Tests: Quizzes and tests will be given on a periodic basis when appropriate. They will typically consist of a combination of multiple choice and constructed response questions typical of the AP exam.

Projects: You will be given one project per quarter. They will vary from individual work to group work, and will be tied to physics that you have or may learn throughout the course of the year.

Textbook Use: The primary textbook for this class is Fundamentals of Physics, 7^{th} Edition (or newer), Halliday, Resnick and Walker, Wiley, 2005.

Grading: The grading is based on a weighted average of Edpuzzles and Do Nows, homework, quizzes, tests, and labs. Edpuzzles and Do Nows are scored as a participation grade where the actual score is not used against you as a student. Everyone gets the same grade as long as you do it.

Quarterly Grade

Edpuzzle	10%
Do Nows	15%
Homework	10%
Labs	15%
Unit and/or Quarterly Exam(s)	15%
Quizzes	25%
Quarterly Project	10%
Total	100%

Final Grade

1st Quarter	20%
2nd Quarter	20%
3rd Quarter	20%
4th Quarter	20%
Class Final	20%
Total	100%

Communication: Communication can be achieved through my website (http://www.wappingersschools.org//Domain/1439). Announcements, links and other forms of communication will be achieved through this site.

I may also be contacted by phone at 298-5100x31070

Extra Help: Students may come for help during the following times:

- TBD

AP Physics C Course Outline

Code: S686 Full Year (11-12)

(rank weight 1.10)

Prerequisite: Current or previous enrollment in a Calculus course required. Successful completion of Honors or Regents Physics with a grade of 85 or better, and a strong history in other Regents Math and science courses. This course is intended as a second year Physics course.

Areas of Study Include:

PART I: MECHANICS:

- UNIT #1: VECTORS (ch. 3):
    - Vectors and scalars
    - Graphical analysis of vectors
    - Component vectors
    - Unit vectors
    - Addition of vectors

- UNIT #2: KINEMATICS (ch. 2 & 4):
    - Motion in one dimension
        - position and displacement, velocity and speed, acceleration
        - constant acceleration and free-fall
        - graphical integration in motion analysis
    - Motion in two dimensions, including projectile motion
    - Uniform circular motion (period, centripetal acceleration)

- UNIT #3: NEWTON'S LAWS OF MOTION (ch. 5 & 6):
    - Newton's First Law of Motion (inertial vs. non-inertial frames of reference)
    - Newton's Second Law of Motion (net external forces on a system)
    - Newton's Third Law of Motion (systems of two or more objects)
    - Applying Newton's Laws (a net force, free-body diagrams)
    - Mass, weight, normal force, friction
    - Uniform circular motion

- UNIT #4: WORK, ENERGY, POWER (ch. 7 & 8):

    - Work, Kinetic Energy and the Work-Energy Theorem
    - Work done by gravity
    - Work done by a spring force
    - Conservation of energy
    - Power

- UNIT #5: SYSTEMS OF PARTICLES, LINEAR MOMENTUM (ch. 9):
    - Center of mass
    - Impulse and Momentum
    - Conservation of linear momentum, collisions in one and two dimensions (elastic and inelastic collisions)

- UNIT #6: ROTATIONAL MOTION (ch. 10 & 11):
    - Rotational kinematics
        - angular displacement, velocity and acceleration
        - relating linear and angular variables
    - Torque and rotational inertia.
    - Work and rotational kinetic energy
    - Angular momentum and its conservation.

- UNIT #7: EQUILIBRIUM (ch. 12):
    - Balance of forces and torques.

- UNIT #8: GRAVITATION (ch. 13):
    - Newton's universal law of gravitation.
    - Gravity near the Earth's surface
    - Orbits of planets and satellites
    - Energy of satellites and planets
    - Kepler's Laws

UNIT #9: OSCILLATIONS & DRAG (ch. 15):
    - Simple harmonic motion (dynamics and energy relationships)
    - Mass on a spring
    - Pendulum and other oscillations
    - Drag friction

PART II: ELECTRICITY AND MAGNETISM:

- UNIT #1: ELECTROSTATICS (ch. 21, 22, 23 & 24):
    - Charge and its conservation
    - Coulomb's Law
    - Electric field and electric potential (including point charges, electric dipoles, plate of charge, line of charge)
    - Gauss's Law
    - Fields and potentials of other charge distributions

- UNIT #2: CONDUCTORS, CAPACITORS, DIELECTRICS (ch. 25):
    - Electrostatics with conductors
    - Capacitors
        - Capacitance
        - Parallel plate
        - Spherical and cylindrical
    - Dielectrics

- UNIT #3: ELECTRIC CIRCUITS (ch. 26 & 27):
    - Current, resistance and power
    - Steady-state direct current circuits with batteries and resistors only
    - Capacitors in circuits
        - Steady state
        - Transients in RC circuits

- UNIT #4: MAGNETIC FIELDS (ch. 28 & 29):
    - Forces on moving charges in magnetic fields
    - Forces on current-carrying wires in magnetic fields
    - Fields of long current-carrying wires
    - Biot-Savart Law and Ampere's Law

- UNIT #5: ELETROMAGNETISM (ch. 30, 31 & 32):
    - Electromagnetic Induction (including Faraday's Law and Lenz's Law)
    - Inductance (including LR and LC circuits)
    - Maxwell's equations

Classroom Rules

Welcome to Mr. Ropes' physics class. My goal is to provide you with an intellectually challenging and positive learning experience. To facilitate your learning, I want to create a caring and considerate environment where you will feel safe both physically and psychologically. The following guidelines should make this possible.

Preparedness:

- Be in your seat when the bell rings. If the bell rings and you are not in your seat, you are late. Please sign the designated notebook if you are late.
- Come to class with a notebook and pen or pencil and calculator.
- Come to class with a positive attitude, alert and ready to learn.

Student Attitudes & Classroom Behavior:

- Raise your hand before speaking.
- Do not talk while I or another student is speaking.
- I do not believe in such a thing as a stupid question, nor should you.
- Be respectful of one another, their property and the school's property.
- Do not use inappropriate language.
- Participate willingly in class discussion and activities. It will help you learn. I promise.
- Always give your best effort.

Seating, Lab Groups, Passes, etc.:

- The general seating assignments will be fixed. Changes will be made from time-to-time at my discretion.
- Students will work in lab groups that may or may not be defined by myself, and will depend on the particular activity.
- Bathroom pass is for one person at a time.
- Late passes will not be given out or accepted except for extenuating circumstances. Four lates constitute as an absence.
- Lunch conflict passes will not be permitted, nor is gum chewing, eating or drinking allowed in the classroom.
- Cell phone use is not permitted unless I request it to be used for the purpose of collecting data. Turn it off or put in on vibrate.

Grading:

- Quizzes and tests are graded as a ratio (# correct/total number of questions).
- Labs are graded on a 10 point scale (See rubric attached).
- Homework is graded as a ratio (# correct/total number of questions).

Homework & Laboratory Activities:

- Homework and laboratory work are a regular part of this course. Extensions will only be given under extenuating circumstances. Homework and lab work that is considered late will be marked down (at my discretion) 10% for each day that it is late up to a maximum of five days.

Make-up Quizzes and Tests:

- Make-up quizzes and tests are offered to those students who have a legitimate reason for being absent from class. Those students that are permitted to take a make-up test will have to do so within three instructional days after their return to school. Students should note that the make-up test will not necessarily be the same as the one given to the rest of the class.

Supplemental Tests / Test Corrections:

- In the event that a student receives a grade less than 85%, a supplemental exam may be taken. However, the maximum value achieved on a supplemental exam cannot exceed 85%.
- Alternatively, I may offer students to make test corrections. Students can obtain $\frac{1}{2}$ credit back for each question that they got wrong. In order to do test corrections, you must come to my class on your free time before, during or even after school. For math related questions, you must properly show how to solve it by showing all work. For conceptual based questions, you must demonstrate why the other choices are incorrect.

Student's Name (print)	Parent/Guardian Name (print)	
Student's Signature	Parent/Guardian Signature	Date
Student's email address	Parent/Guardian email address	

Day Phone #: _____

Evening Phone#: _____

Pacing and Labs

Section 1 – Mechanics:

Sept. - Unit 1: Vectors and Equilibrium

- Building Vector Lab?
- Find the mass of the unknown lab. (3 masses w/2 pulleys)

Unit 2: Kinematics: 1D and 2D Motion

- 1D Motion Lab (Cart on Inclined Track)
- 2D Projectile Motion Lab (Balloon Launch)
- g Lab

Oct. - Unit 3: Forces, Newton's Laws, Friction and Centripetal Motion

- Newton's 2nd Law – Atwood Machine Lab
- Friction Lab (mu of the shoe?)
- Centripetal Motion and Friction (Pascoe rotational apparatus)

Nov. - Unit 4: Work, Energy, Power and Springs

- Hooke's Law – Springs in Series and Parallel Lab

Unit 5: Impulse & Momentum

- Collisions in 2D Lab

Dec. - Unit 6: Rotational Kinematics and Dynamics, Conservation of Angular Momentum

- Torque
- Rotational Inertia Lab
- Angular Momentum Lab (Pascoe rotational apparatus)

Unit 7: Equilibrium

- Torque Lab (meter sticks…)

Jan. - Unit 8: Newton's Universal Law of Gravitation, Planetary Motion

Unit 9: Simple Harmonic Motion and oscillations

- Cart on Incline with Spring Lab

Unit 9: Differential equation force based problems (i.e. terminal velocity and drag force).

- Coffee Filter Lab