AP Physics 2 Student Syllabus

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Room 301
Office hours: 7:30 – 8:00 am or by appointment

Textbook

Serway, Vuille (2015), *College Physics* (10th ed.). Stamford, CT: Cengage Learning.

Course Overview

The AP Physics 2 course will meet for 48 minutes every day. Lab work is integral to the understanding of the concepts in this course. The AP Physics 2 course has been designed by the College Board as a course equivalent to the second semester of an algebra-based freshman level college physics class. At the end of the course, students will take the AP Physics 2 Exam, which will test their knowledge of both the concepts taught in the classroom and their use of the correct formulas. The course focuses on the interconnections between the various strands and units contained in the course syllabus and how each contributes to the "Big Ideas" that provide a core foundation for this science course. Problem solving techniques and strategies are fined tuned throughout the year, and students are continually tasked with connecting physics applications learned in different units in order to synthesize solutions to complex problems. The emphasis on theoretical topics, critical thinking and problem solving makes this class challenging. Mathematics is used to illuminate physical situations rather than to show off a student's manipulative abilities. Students must be strong in both math and science to be successful in this course. Conceptual understanding of the material is a requirement for success. Students will be expected to write justifications and explanations of physics concepts. Students have the opportunity to meet the learning objectives in a variety of ways and to apply their knowledge to real world experiences. Instructional time involves a variety of student-centered activities. Students have the opportunity to work cooperatively to solve challenging problems and to present their solutions to the class. Throughout the year, connections to the world are explored in discussions and class demonstrations. Laboratory work, described below, offers frequent opportunities to work collaboratively, explore ideas, and present information. Outside of class, students read the assigned text and complete homework assignments that support and reinforce each lesson as well as what has been learned in the laboratory setting.

The content for the course is based on six big ideas: Big Idea…

1. Objects and systems have properties such as mass and charge. Systems may have internal structure.
2. Fields existing in space can be used to explain interactions.
3. The interactions of an object with other objects can be described by forces.
4. Interactions between systems can result in changes in those systems.
5. Changes that occurs as a result of interactions are constrained by conservation laws.
6. Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomenon.

Grading/Evaluation

Assignments = 10%, quizzes = 15%, laboratory work = 25%, tests = 50%.

Tests will consist of questions similar to those students will see on the AP Exam.

Assignments/ quizzes will consist of problems/concepts from the textbook and old AP Exams. Laboratory work is student centered and inquiry based.

Tests: 3 per trimester. 100 points each (50% of grade)

Labs: 3 per trimester 25 points each (25%)

Quizzes: 6 per trimester 10 – 30 points (15%)

Assignments as deemed necessary (10%)

Laboratory Investigations:

Students spend approximately 25% of the instructional time on laboratory work. Experiments designed by the instructor are used to demonstrate procedural guidelines and to learn how to use specific laboratory equipment. The majority of labs are inquiry-based where students are given an objective and a set of materials. They are tasked with designing a procedure and collecting data to determine specific quantities, determine the relationship between variables, and/or to derive fundamental physics equations. Laboratory design, experimentation, data gathering, data presentation, analysis, drawing conclusions, and experimental error analysis are elements in these lab activities. Laboratory work is recorded in a laboratory notebook/binder, and students will have opportunities to present their laboratory work to their peers. Lab reports will consist of the following components: -Title -Overview/Purpose -Experimental Design/Procedure (for guided inquiry & open inquiry, the design must be created by the students and approved by the teacher before experimentation may begin) -Data -Calculations and/or graphs -Conclusion (including data and error analysis, summary of results).

Supplies:

Dedicated binder (with a separate section for labs) Graph paper (required for labs) Ruler Loose leaf paper Black dry erase/Expo marker Calculator, writing utensils, textbook

Classroom Rules:

1. Students are to be respectful of all people, including themselves, their peers, and teachers. Hurtful comments or disrupting anyone at any time is not allowed.
2. Students are to be respectful of their physical surroundings. This includes proper use of the materials supplied and the classroom environment.
3. Students will not use cell phones and personal music players. Usage of these devices will be handled according to handbook policy.
4. Students are expected to follow all rules printed in the student handbook at all times.
5. Cheating: don’t do it. Any cheating will be handled in the severest way allowed by the student handbook.

Course Outline

Unit	Chapter	Learning Objectives
1. **Fluids** Big Ideas 1, 3, 5 (Weeks 1-2 Mid-September) * Density * Pressure * Pascal's principle * Buoyant force/Archimedes' principle * Fluid flow/continuity * Bernoulli's Equation	9	1.E.1.1, 1.E.1.2, 3.A.2.1, 3.A.3.3, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.4, 3.B.2.1, 3.C.4.1, 3.C.4.2, 5.B.10.1, 5.B.10.2, 5.B.10.3, 5.B.10.4, 5.F.1.1
2. **Thermodynamics** Big Ideas 1, 4, 5, 7 (Weeks 3-8 Late October) * Kinetic Theory * Ideal Gases * 1st Law of thermodynamics * Thermodynamic Processes * PV Diagrams * 2nd Law of thermodynamics * Heat engines; Carnot cycle	10, 11, 12	1.E.3.1, 4.C.3.1, 5.B.2.1, 5.B.4.1, 5.B.4.2, 5.B.5.4, 5.B.5.5, 5.B.5.6, 5.B.6.1, 5.B.7.1, 5.B.7.2, 5.B.7.3, 7.A.1.1, 7.A.1.2, 7.A.2.1, 7.A.2.2, 7.A.3.1, 7.A.3.2, 7.A.3.3, 7.B.1.1, 7.B.2.1
3. **Electrostatics** Big Ideas 1, 2, 3, 4, 5 (Weeks 9-10 Mid-November) * Coulomb's Law * Electric Field * Electric Potential	15	1.B.1.1, 1.B.1.2, 1.B.2.1, 1.B.2.2, 1.B.2.3, 1.B.3.1, 2.C.1.1, 2.C.1.2, 2.C.2.1, 2.C.3.1, 2.C.4.1, 2.C.4.2, 2.C.5.1, 2.C.5.2, 2.C.5.3, 2.E.2.1, 2.E.2.2, 2.E.2.3, 2.E.3.1, 2.E.3.2, 3.A.2.1, 3.A.3.2, 3.A.3.3, 3.A.3.4, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.3, 3.B.1.4, 3.B.2.1, 3.C.2.1, 3.C.2.2, 3.C.2.3, 3.G.1.2, 3.G.2.1, 3.G.3.1, 4.E.3.1, 4.E.3.2, 4.E.3.3, 4.E.3.4, 4.E.3.5, 5.C.2.1, 5.C.2.2, 5.C.2.3
4. **Electric Circuits** Big Ideas 1, 4, 5 (Weeks 11-16 Early January) * Resistance * Ohm's Law * DC Circuits (schematics, series, parallel, compound) * Kirchhoff's Laws * Capacitance * RC circuits	16, 17, 18	1.E.2.1, 4.E.4.1, 4.E.4.2, 4.E.4.3, 4.E.5.1, 4.E.5.2, 4.E.5.3, 5.B.9.4, 5.B.9.5, 5.B.9.6, 5.B.9.7, 5.B.9.8, 5.C.3.4, 5.C.3.5, 5.C.3.6, 5.C.3.7
5. **Magnetism & Electromagnetic Induction** Big Ideas 2, 3, 4 (Weeks 17-19 Late January) * Magnetic Field * Magnetic Force (on charged particles; on current carrying wires) * Magnetic Flux * Faraday's Law * Lenz's Law * Motional emf	19, 20	2.C.4.1, 2.D.1.1, 2.D.2.1, 2.D.3.1, 2.D.4.1, 3.A.2.1, 3.A.3.2, 3.A.3.3, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.4, 3.B.2.1, 3.C.3.1, 3.C.3.2, 3.G.1.2, 3.G.2.1, 4.E.1.1, 4.E.2.1
6. **Optics** Big Idea 6 (Weeks 20-25 Mid-February) * Electromagnetic spectrum * Reflection * Mirrors (diagram & equation) * Refraction & Snell's Law * Interference * Diffraction * Thin film interference	23, 24, 25	6.A.1.2, 6.A.1.3, 6.A.2.2, 6.B.3.1, 6.C.1.1, 6.C.1.2, 6.C.2.1, 6.C.3.1, 6.C.4.1, 6.E.1.1, 6.E.2.1, 6.E.3.1, 6.E.3.2, 6.E.3.3, 6.E.4.1, 6.E.4.2, 6.E.5.1, 6.E.5.2, 6.F.1.1, 6.F.2.1
7. **Atomic, Nuclear, & Modern** Big Ideas 1, 3, 4, 5, 6, 7 (Weeks 26-33 Early May) * Atomic structure & isotopes * Fundamental Forces * Photons * Photoelectric Effect * Compton Scattering / Photon Momentum & Photon-Particle Collisions * Wave-particle duality/ DeBroglie Wavelength * Atomic Energy levels * Absorption & emission spectra * Quantum Mechanics, Wave Functions & Probability * Electron Diffraction * Mass-energy equivalence * Radioactive Decay (α, β, γ decay & half-life) * Fission & Fusion	27, 28, 29, 30	1.A.2.1, 1.A.4.1, 1.C.4.1, 1.D.1.1, 1.D.3.1, 3.G.1.2, 3.G.3.1, 4.C.4.1, 5.B.8.1, 5.B.11.1, 5.C.1.1, 5.D.1.6, 5.D.1.7, 5.D.2.5, 5.D.2.6, 5.D.3.2, 5.D.3.3, 5.G.1.1, 6.F.3.1, 6.F.4.1, 6.G.1.1, 6.G.2.1, 6.G.2.2, 7.C.1.1, 7.C.2.1, 7.C.3.1, 7.C.4.1