Montclair High School
Course Syllabus

Department: Science
Course: AP Physics 2
Level: Advanced Placement
Credits: 6

Course Description:
AP Physics 2 is the second year of a two-year algebra based AP Physics program. The course will meet for six 44-minute periods per week with two of the six periods devoted to lab work, and a minimum of one period per week devoted to group problem solving. The course is designed to be the equivalent of an algebra-based college physics course.

Standards:
As per the College Board

Anchor Text(s):

Text Title	Publisher/Author	Year/Edition	ISBN	Text Distribution
Physics	John Wiley & Sons/ John Cutnell and Kenneth Johnson	2015/10th edition	978-1-118-48689-1	Hard copy

Supplementary Materials:
Walker, Jearl. Fundamentals of Physics 8th Edition. John Wiley and Sons Inc. New York, 2007.

Units of Study:
- FLUIDS (Big Ideas: 1, 3, and 5)
    - Properties of fluids—gases and liquids
    - Hydrostatic Pressure and Pascal's Principle
    - Buoyancy (Archimedes' Principle)
    - Fluid Flow Continuity (Conservation of Mass)
    - Conservation of Energy and Bernoulli's Principle

- THERMODYNAMICS (Big Ideas: 1, 4, 5, and 7)
    - Temperature
    - Pressure
    - Heat/Energy Transfer
    - Ideal gases
    - Kinetic Theory
    - Laws of Thermodynamics
    - Entropy
    - PV Diagrams
    - Probability and Thermal Equilibrium

- ELECTRICITY AND MAGNETISM (Big Ideas: 1,2, 3, 4, and 5)
    - Elementary Charges and Fundamental Particles
    - Charging and Redistribution of Charge
    - Equipotentials
    - Electric Dipoles
    - Electric Current Simple DC Circuits (Ohm's Law/ Kirchhoff's Laws) Steady-State RC Circuits
    - Magnetism and Sources of Magnetic Fields
    - Magnetic Forces
    - Charged Particles Moving in Magnetic Fields
    - Electromagnetic Induction (Faraday and Lenz's Laws)
    - AC Circuits (introduction with transformers and other practical applications)

- OPTICS (Big Ideas: 1, 3, 4, 5, 6, and 7)
    - Nature of Light and Electromagnetism
    - Reflection, Mirrors, and Critical Angle
    - Refraction and Lenses
    - Total Internal Reflection
    - Thin Film Interference
    - Polarization
    - Interference and Diffraction

- MODERN PHYSICS (Big Ideas: 1, 2,3, 4, 5, 6, and 7)

1. Brief History and Development of Modern Physics in the Late 19th and Early 20th Centuries
2. Fundamental Forces
3. Theory of Photons and Photoelectric Effect
4. Nuclear Physics: Radioactivity, Nuclear Reactions, Radiations, and Half Life
5. Mass-Energy Equivalence
6. Quantized Energy States for Electrons in Atoms
7. Energies of Photon Emission and Absorption
8. Wave Particle Duality, de Broglie Wavelength
9. Electron Diffraction
10. Photon Momentum and Photon/Particle Collisions

Proficiencies:

AP Physics 2 course content is based on 6 big ideas and 7 science practices:

- Big Idea 1: Objects and systems have properties such as mass and charge. Systems may have internal structure.
- Big Idea 2: Fields existing in space can be used to explain interactions.
- Big Idea 3: The interactions of an object with other objects can be described by forces
- Big Idea 4: Interactions between systems can result in changes in those systems
- Big Idea 5: Changes that occur as a result of interactions are constrained by conservation laws
- Big Idea 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 phenomena
- Big Idea 7: The mathematics of probability can be used to describe the behavior of complex systems and to interpret the behavior of quantum mechanical systems.

- Science Practice 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems
- Science Practice 2: The student can use mathematics appropriately
- Science Practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course
- Science Practice 4: The student can plan and implement data collection strategies in relation to a particular scientific question
- Science Practice 5: The student can perform data analysis and evaluation of evidence
- Science Practice 6: The student can work with scientific explanations and theories
- Science Practice 7: The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains

Evaluation & Assessment:
Students will be graded based on tests, quizzes, labs, homework, and projects. All students must maintain a lab notebook to record observations, data, data analysis, conclusions, and possible alterations of lab methods for all labs.

Grades are distributed as follows:

Tests and Quizzes	60%
Labs and Projects	30%
Homework and Classwork	10%

The Final Grade will consist of each marking period (22.5% each), the midterm exam (5%) and the final exam (5%)

Prior to beginning any lab activities, all students must have submitted a Safety Contract which has been duly signed by both the student and their parent/guardian. This contract will be kept on file by the teacher for the duration of the course.