

COURSE SYLLABUS

AP PHYSICS I

INSTRUCTOR & EMAIL:	David K Hurd – dhurd@times2.org
ROOM:	Engineering Lab – room 129
OFFICE HOURS:	2:45-3:45 MWR

COURSE DESCRIPTION/OVERVIEW: The following topics will be covered at a post-secondary level: Kinematics, Dynamics: Newton’s laws, Circular motion and universal law of gravitation, Simple harmonic motion: simple pendulum and mass-spring systems, Impulse, linear momentum, and conservation of linear momentum: collisions, Work, energy, and conservation of energy, Rotational motion: torque, rotational kinematics and energy, rotational dynamics, and conservation of angular momentum, Electrostatics: electric charge and electric force , DC circuits: resistors only, Mechanical waves and sound.

If time permits, the following additional topics will be covered at a post-secondary level: Thermodynamics: laws of thermodynamics, ideal gases, and kinetic theory. Fluid statics and dynamics. Electrostatics: electric field and electric potential. RC circuits (steady-state only), Magnetism and electromagnetic induction. Geometric and physical optics. Quantum physics, atomic, and nuclear physics.

GOALS: To prepare students for the A.P. Physics I exam for college credit.

COMMON CORE STANDARDS OVERVIEW: Covers the NGSS Physical science standards (Structure and properties of matter, Forces and Interactions, Energy, & Waves and Electromagnetic Radiation).

CLASSROOM RULES/PROCEDURES: All Times2 STEM Academy rules are in place.

GRADING POLICY: The midterm/final exams will count for a combined 20% of the final grade. Each quarter will count for 40% of the cumulative grade and is scored as follows:

- Category I: Unit tests 50%
- Category II: Lab Reports 25%
- Category III: Homework 25%

Scope & Sequence

Sequence	TOPIC	ASSIGNMENTS
Unit 1	Kinematics in 1 Dimension	Speed, Velocity and Acceleration 2d Galilean Kinematics Free Fall Graphical Analysis Lab 1: Free Fall
Unit 2	Kinematics in 2 Dimensions	Trigonometry, scalars, vectors Vector Components & Addition Kinematics in 2 dimensions Projectile Motion Lab 2: Projectile Motion
Unit 3	Newton’s Laws of Motion	1 st and 2 nd laws of motion 2 nd and 3 rd law with vectors Newton’s Laws – equilibrium Newton’s Laws – non equilibrium Lab 3: Law of Acceleration

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Unit 4	Uniform Circular Motion	Centripetal Acceleration Centripetal Force Gravity Satellite Motion (orbits) Lab 4: Centripetal Force
Unit 5	Work and Energy	Work-Energy Theorem Potential Energy Conservation of Energy Power & non-mechanical energy Lab 5: Conservation of Mechanical energy.
Unit 6	Impulse and momentum	Impulse-Momentum Theorem Conservation of Momentum Collisions in one dimension Collisions in two dimensions Lab 6: Elastic and Inelastic Collisions
Unit 7	Rotational Dynamics	Rotational Kinematics Torque & Equilibrium Newton's Law's for Rotation Work, Energy & momentum Lab 7: Rotational energy vs linear energy
Unit 8	Simple Harmonic Motion	Ideal Spring and SHM Energy and SHM The Pendulum and SHM Stress, Strain & Hooke's Law Lab 8: Energy Conservation in SHO
Unit 9	Waves and Sound	Wave Nature Sound Properties Intensity & decibel Level Doppler Effect Lab 9: Mechanical Wave velocity
Unit 10	Wave Interference	Superposition & Interference Diffraction & Beats Transverse Standing Waves Longitudinal Standing Waves Lab 10: Closed Tube Resonance of Sound
Unit 11	Electric Fields & Potential	Electrostatic Charge & Force Electric Fields and Lines Electric Potential Difference Electric Potential Lab 11: Equipotential lines investigation.
Unit 12	Electric Circuits	Ohm's Law, Power, Resistance Resistors in Series & Resistors in Parallel Complex Circuits (Kirchoff's Rules) Lab 12: Kirchoff's Loop and Junction Rules
Additional Topics from AP Physics II (Time permitting)		
Unit 13	Temperature & Heat	Temp & Thermal Expansion Internal Energy & Heat Capacity Calorimetry Latent Heat Capacity Lab 13: Calorimetry

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Unit 14	Kinetic Theory	Modes of Heat Transfer Molecular Mass & Moles Ideal Gas Law Kinetic Theory of Gases Lab 14: molecular workbench simulation at http://mw2.concord.org/public/part2/heat/index.cml
Unit 15	Thermodynamics	Zeroth & First Laws Thermal Processes Second Law & Heat Engines Entropy & Third Law Lab 15: Heat Engines (Vernier) or Entropy
Unit 16	Magnetic Forces and Fields	Magnetic Fields and Force Mass Spectrometer Force on a Current in a Field Torque & Magnetic Fields Lab 16: Milliken Experiment Inquiry
Unit 17	Electromagnetic Induction	Motional EMF Flux & Faraday's Law Electric Generator Inductance & Transformers Lab 17: Faraday's Law
Unit 18	Geometric Optics	Reflection & Spherical Mirrors Refraction/Snell's Law Total Internal Reflection Thin Lens Image Formation Lab 18: Image Formation
Unit 19	Physical Optics	Electromagnetic Waves Young's Double Slit Exp. Thin-Film Interference Diffraction (single & grating) Lab 19: Wavelength using Diffraction Gratings
Unit 20	Special Relativity	Time & Length Relativistic Momentum Mass and Energy Relative Velocity Lab 20: Hubble's Law for Relativistic Red Shifts
Unit 21	Nuclear Physics	Mass Defect & Binding Energy Radioactivity Radioactive Decay & Dating Nuclear Fission & Fusion Lab 21: Radio-Carbon Fossil Dating
Unit 22	Quantum Mechanics	Blackbody/ Photoelectric Effect Compton/ DeBroglie/ Heisenberg Rutherford/Bohr model Quantum Physics Lab 22: Stellar Classification or Spectroscopy