AP-Physics 1 Syllabus

Course Overview

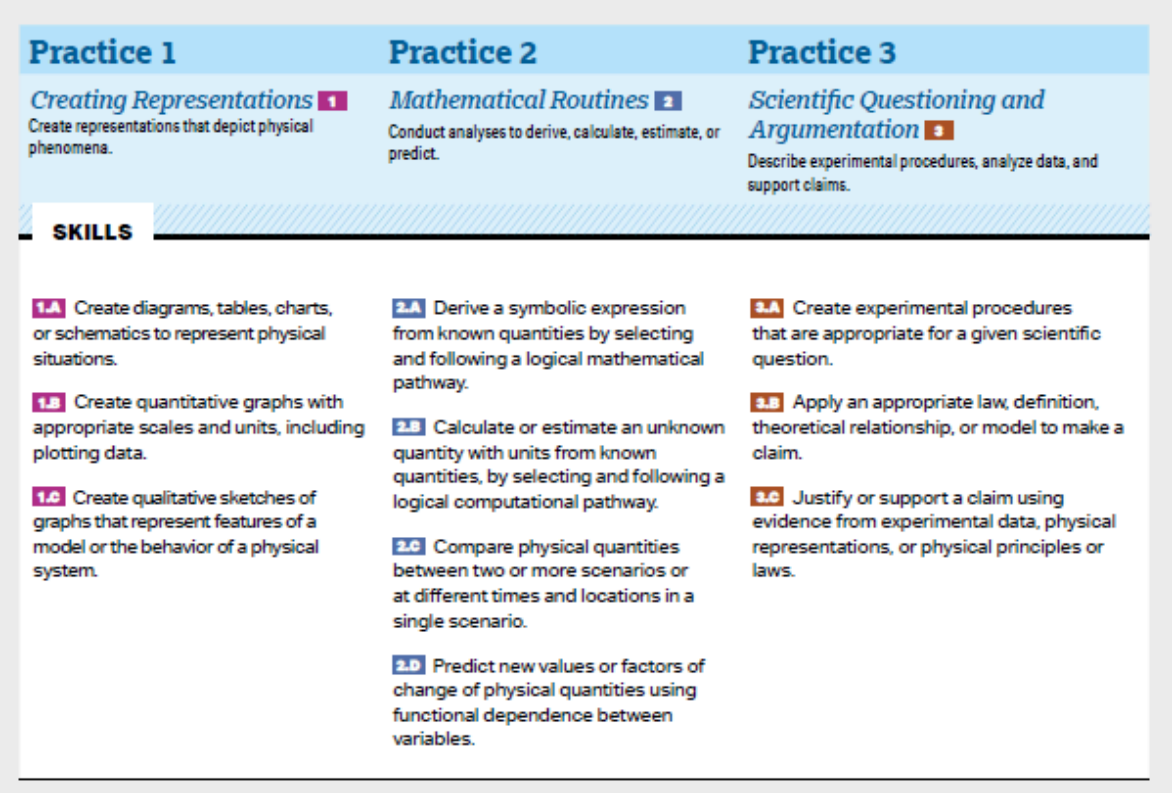
The course meets for eight (8) classroom periods per eight day rotation. Each period lasts 60 minutes. Laboratory work is performed during one of two double (120 minute) blocks. Lab work includes both inquiry (or open-ended) and guided investigations. The labs listed are all conducted by the student.

The course emphasizes multi-step problem solving and encourages students to construct meaning from observation and data. Student assessment is based on examinations, employing problem solving and conceptual questions; and laboratory work.

Text:
College Physics for AP Courses, David Anderson et.al
ISBN-13 978-1-938169-93-2
https://openstax.org/details/books/college-physics-ap-courses

Supplemental Text:
Physics, 3rd Edition, Jerry D. Wilson and Anthony J. Buffa,

Science Practices for AP Physics



Practice 1	Practice 2	Practice 3
Creating Representations 1 Create representations that depict physical phenomena.	*Mathematical Routines* 2 Conduct analyses to derive, calculate, estimate, or predict.	*Scientific Questioning and Argumentation* 3 Describe experimental procedures, analyze data, and support claims.
SKILLS		
1.A Create diagrams, tables, charts, or schematics to represent physical situations.	2.A Derive a symbolic expression from known quantities by selecting and following a logical mathematical pathway.	3.A Create experimental procedures that are appropriate for a given scientific question.
1.B Create quantitative graphs with appropriate scales and units, including plotting data.	2.B Calculate or estimate an unknown quantity with units from known quantities, by selecting and following a logical computational pathway.	3.B Apply an appropriate law, definition, theoretical relationship, or model to make a claim.
1.C Create qualitative sketches of graphs that represent features of a model or the behavior of a physical system.	2.C Compare physical quantities between two or more scenarios or at different times and locations in a single scenario.	3.C Justify or support a claim using evidence from experimental data, physical representations, or physical principles or laws.
	2.D Predict new values or factors of change of physical quantities using functional dependence between variables.	

Unit Descriptions

Unit 1: One and Two Dimensional Kinematics Chapter 2, 3	
Course Sequence	**Student Labs and Activities**
• Kinematic Variables • Kinematics in One Dimension • Vector components and addition • Kinematics in Two Dimensions • Projectile Motion	• Measurement Lab • Toy Car Speed Lab Activity • Instantaneous Velocity on an Incline • Acceleration on an Incline • Acceleration due to Gravity • Acceleration in Spring Loaded System • Reaction Time Lab • Projectile Range – Horizontal • Ball in the Cup Lab • Projectile Range at Different Angles • Analysis of Field Goal Kicking • Walk Around the School

Unit 2: Dynamics Chapter 4 - 6	
• Common Forces and Free Body Diagrams • Newton's First Law • Newton's Second Law • Newton's Third Law • Applications of Newton's Second Law • Friction • Inclines • Rope & Pulley Problems • Uniform Circular Motion • Dynamics of UCM - Centripetal Force • Law of Universal Gravitation	• Newton's 2nd Law Lab • Equilibrium Round Robin • Coefficient of Static and Kinetic Friction Lab • Atwood's Machine Lab • Determination of Coefficient of Static Friction for Running Shoes • Centripetal Motion Lab • Centripetal Acceleration of a Fan Activity • Coefficient of Static Friction on Rotating Turntable • Investigation of Weight Change in Elevator • Kepler's Laws of Planetary Motion Activity • Solar System Computer Simulation

<table>
<tr><td colspan="2">Unit 3: Work, Energy & Power
Chapter 7</td></tr>
<tr><td>• Work
• Power
• Kinetic Energy
• Potential Energy
• Conservation of Energy</td><td>• Investigation of Work on and Inclined Plane
• Conservation of Energy in Pendulum System
• Hooke’s Law Lab
• Determination of Spring Constant for Projectile Shooter
• Determination of Power Output for Students on Stairs
• Computer Simulation – Conservation of Energy
• Ball on a Ramp Lab</td></tr>
<tr><td colspan="2">Unit 4: Momentum
Chapter 8</td></tr>
<tr><td>• Impulse
• Momentum
• Conservation of Momentum
• Elastic and Inelastic Collisions</td><td>• Inelastic Collisions on Air Track
• Explosions using Dynamics Carts
• Conservation of Momentum in Ball Bearing Collisions
• Ballistic Pendulum Lab
• Determination of Force in Throwing a Baseball</td></tr>
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<tr><td colspan="2">Unit 5: Torque and Rotational Motion
Chapter 9-10</td></tr>
<tr><td>• Torque
• Center of Mass
• Rotational Kinematics
• Rotational Dynamics
• Rotational energy
• Angular Momentum
• Conservation of Angular Momentum</td><td>• Determination of Center of Mass of Students
• Balance Torque Lab
•</td></tr>
<tr><td colspan="2">Unit 6: Energy and Momentum for Rotating Systems

Chapter 9-10</td></tr>
<tr><td>• Rotational Dynamics
• Rotational Energy
• Angular Momentum
• Conservation of Angular Momentum</td><td>• Conservation of Energy for Objects Rolling on and Incline Lab
• Rotational Inertia and Translational Motion

• Conservation of Angular Momentum Activity</td></tr>
<tr><td colspan="2">Unit 7: Oscillations
Chapter 16</td></tr>
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• Restoring Forces and Simple Harmonic Motion • Simple Pendulum • Spring Mass Systems • Simple Harmonic Motion Graphs	• SHM Using Spring Investigation • Simple Pendulum Lab • Wave Investigation using Slinkys • Standing Wave Patterns in Vibrating String
Unit 8: Fluids Chapter 11-12	
• Density, Pressure • Gauge Pressure vs Absolute • Pascal's Principle • Archimedes Principle • Flow Rate • Continuity Equation • Bernoulli's Equation	• Pressure Lab • Buoyancy Lab • Torricelli's Lab

Additional Course Information

Lab Investigations

Lab investigations support the construction understanding of physical principles as well as provide an opportunity for students to apply all seven science practices.
Students spend at least 25% of class time in laboratory activities, which are hands on and inquiry based.
Students work cooperatively in groups but, for most investigations, must *each* submit an individual formal lab report. Students are required to organize their lab investigations in a lab notebook.
The format for the formal lab report must include

- Introduction (Problem, Hypothesis, Discussion)
- Materials
- Data and Observations
- Analysis
- Conclusion with Error Analysis