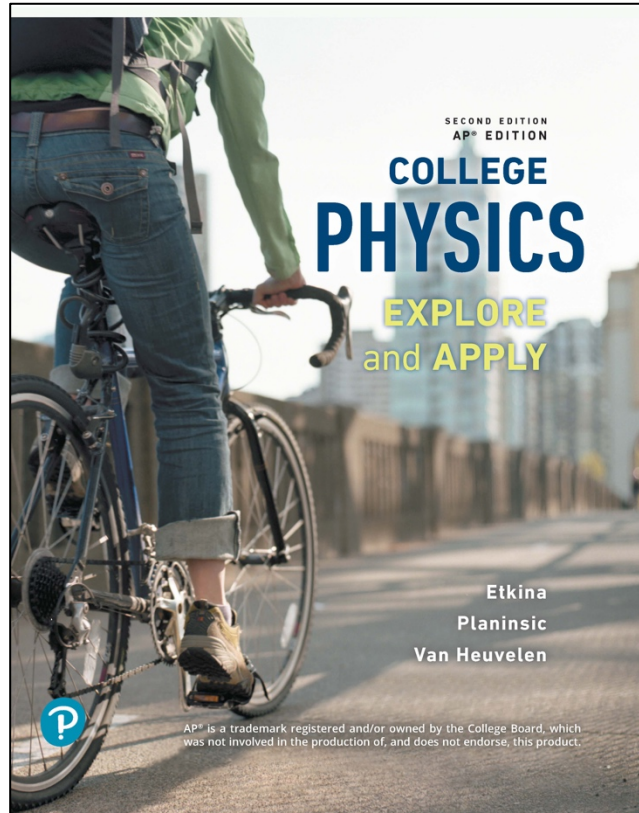A Correlation of

College Physics:
Explore and Apply

2nd Edition, AP® Edition ©2019

To the

AP® Physics 1
Course Framework
Effective Fall 2024

**A Correlation of College Physics: Explore and Apply 2nd Edition, AP® Edition ©2019
to the College Board AP® Physics 1 Course Framework**

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The units above reflect the College Board's AP® Physics 1 Course Framework.

Unit 1: Kinematics (5 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
1.1 Scalars and Vectors in One dimension	1.1.A Describe a scalar or vector quantity using magnitude and direction, as appropriate. 1.1.B Describe a vector sum in one dimension.	1.5 Vector and scalar quantities 2.3 Operations with vectors
1.2 Displacement, Velocity, and Acceleration	1.2.A Describe a change in an object's position. 1.2.B Describe the average velocity and acceleration of an object.	2.4 Quantities for describing motion 2.6 Constant velocity linear motion 2.7 Motion at constant acceleration 2.8 Displacement of an object moving at constant acceleration
1.3 Representing Motion	1.3.A Describe the position, velocity, and acceleration of an object using representations of that object's motion.	2.6 Constant velocity linear motion 2.7 Motion at constant acceleration 2.8 Displacement of an object moving at constant acceleration 2.9 Skills for analyzing situations involving motion
1.4 Reference Frames and Relative Motion	1.4.A Describe the reference frame of a given observer. 1.4.B Describe the motion of objects as measured by observers in different inertial reference frames.	2.1 What is motion? 2.5 Representing motion with data tables and graphs
1.5 Vectors and Motion in Two Dimensions	1.5.A Describe the perpendicular components of a vector. 1.5.B Describe the motion of an object moving in two dimensions.	4.1 Vectors in two dimensions and force components 4.5 Projectile motion

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Unit 2: Force and Translational Dynamics (9 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
2.1 Systems and Center of Mass	2.1.A Describe the properties and interactions of a system. 2.1.B Describe the location of a system's center of mass with respect to the system's constituent parts.	3.1 Describing and representing interactions 8.1 Extended and rigid bodies 8.4 Center of mass
2.2 Forces and Free-Body Diagrams	2.2.A Describe a force as an interaction between two objects or systems. 2.2.B Describe the forces exerted on an object or system using a free-body diagram.	3.1 Describing and representing interactions
2.3 Newton's Third Law	2.3.A Describe the interaction of two objects using Newton's third law and a representation of paired forces exerted on each object.	3.8 Forces come in pairs: Newton's third law 4.4 Skills for analyzing processes involving forces in two dimensions
2.4 Newton's First Law	2.4.A Describe the conditions under which a system's velocity remains constant.	3.4 Inertial reference frames and Newton's first law 4.4 Skills for analyzing processes involving forces in two dimensions
2.5 Newton's Second Law	2.5.A Describe the conditions under which a system's velocity changes.	3.5 Newton's second law 4.2 Newton's second law in component form 4.4 Skills for analyzing processes involving forces in two dimensions

Unit 2: Force and Translational Dynamics (9 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
2.6 Gravitational Force	2.6.A Describe the gravitational interaction between two objects or systems with mass. 2.6.B Describe situations in which the gravitational force can be considered constant. 2.6.C Describe the conditions under which the magnitude of a system's apparent weight is different from the magnitude of the gravitational force exerted on that system. 2.6.D Describe inertial and gravitational mass.	3.6 Gravitational force law 5.5 The law of universal gravitation
2.7 Kinetic and Static Friction	2.7.A Describe kinetic friction between two surfaces. 2.7.B Describe static friction between two surfaces.	4.3 Friction 4.4 Skills for analyzing processes involving forces in two dimensions
2.8 Spring Forces	2.8.A Describe the force exerted on an object by an ideal spring.	7.4 Quantifying elastic potential energy
2.9 Circular Motion	2.9.A Describe the motion of an object traveling in a circular path. 2.9.B Describe circular orbits using Kepler's third law.	5.1 Qualitative dynamics of circular motion 5.2 Analyzing velocity change for circular motion 5.3 Radial Acceleration and period 5.4 Skills for analyzing processes involving circular motion 5.5 The law of universal gravitation

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Unit 3: Work, Energy, and Power (5 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
3.1 Translational Kinetic Energy	3.1.A Describe the translational kinetic energy of an object in terms of the object's mass and velocity.	7.1 Work and energy 7.3 Quantifying gravitational potential and kinetic energies
3.2 Work	3.2.A Describe the work done on an object or system by a given force or collection of forces.	7.1 Work and energy 7.6 Skills for analyzing processes using the work-energy principle
3.3 Potential Energy	3.3.A Describe the potential energy of a system.	7.1 Work and energy 7.3 Quantifying gravitational potential and kinetic energies 7.4 Quantifying elastic potential energy 7.9 Improving our model of gravitational potential energy
3.4 Conservation of Energy	3.4.A Describe the energies present in a system. 3.4.B Describe the behavior of a system using conservation of mechanical energy principles. 3.4.C Describe how the selection of a system determines whether the energy of that system changes.	7.1 Work and energy 7.2 Energy is a conserved quantity 7.3 Quantifying gravitational potential and kinetic energies 7.4 Quantifying elastic potential energy 7.5 Friction and energy conversion 7.6 Skills for analyzing processes using the work-energy principle
3.5 Power	3.5.A Describe the transfer of energy into, out of, or within a system in terms of power.	7.8 Power

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Unit 4: Linear Momentum (4 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
4.1 Linear Momentum	4.1.A Describe the linear momentum of an object or system.	6.2 Linear momentum
4.2 Change in Momentum and Impulse	4.2.A Describe the impulse delivered to an object or system. 4.2.B Describe the relationship between the impulse exerted on an object or a system and the change in momentum of the object or system.	6.3 Impulse and momentum 6.4 The generalized impulse-momentum principle 6.5 Skills for analyzing problems using impulse and momentum
4.3 Conservation of Linear Momentum	4.3.A Describe the behavior of a system using conservation of linear momentum.	6.2 Linear momentum 6.3 Impulse and momentum 6.4 The generalized impulse-momentum principle 6.5 Skills for analyzing problems using impulse and momentum
4.4 Elastic and Inelastic Collisions	4.4.A Describe whether an interaction between objects is elastic or inelastic.	7.7 Collisions

Unit 5: Torque and Rotational Dynamics (6 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
5.1 Rotational Kinematics	5.1.A Describe the rotation of a system with respect to time using angular displacement, angular velocity, and angular acceleration.	9.1 Rotational kinematics 9.2 Physical quantities affecting rotational acceleration
5.2 Connecting Linear and Rotational Motion	5.2.A Describe the linear motion of a point on a rotating rigid system that corresponds to the rotational motion of that point, and vice versa.	8.1 Extended and rigid bodies 9.1 Rotational kinematics 9.2 Physical quantities affecting rotational acceleration
5.3 Torque	5.3.A Identify the torques exerted on a rigid system. 5.3.B Describe the torques exerted on a rigid system.	8.1 Extended and rigid bodies 8.2 Torque: a new physical quantity 9.2 Physical quantities affecting rotational acceleration
5.4 Rotational Inertia	5.4.A Describe the rotational inertia of a rigid system relative to a given axis of rotation. 5.4.B Describe the rotational inertia of a rigid system rotating about an axis that does not pass through the system's center of mass.	8.1 Extended and rigid bodies 9.2 Physical quantities affecting rotational acceleration 9.3 Newton's second law for rotational motion
5.5 Rotational Equilibrium and Newton's First Law in Rotational Form	5.5.A Describe the conditions under which a system's angular velocity remains constant.	8.3 Conditions of equilibrium 8.5 Skills for analyzing situations using equilibrium conditions
5.6 Newton's Second Law in Rotational Form	5.6.A Describe the conditions under which a system's angular velocity changes.	9.2 Physical quantities affecting rotational acceleration 9.3 Newton's second law for rotational motion

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Unit 6: Energy and Momentum of Rotating Systems (6 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
6.1 Rotational Kinetic Energy	6.1.A Describe the rotational kinetic energy of a rigid system in terms of the rotational inertia and angular velocity of that rigid system.	9.5 Rotational kinetic energy
6.2 Torque and Work	6.2.A Describe the work done on a rigid system by a given torque or collection of torques.	(none)
6.3 Angular Momentum and Angular Impulse	6.3.A Describe the angular momentum of an object or rigid system. 6.3.B Describe the angular impulse delivered to an object or rigid system by a torque. 6.3.C Relate the change in angular momentum of an object or rigid system to the angular impulse given to that object or rigid system.	9.4 Rotational momentum
6.4 Conservation of Angular Momentum	6.4.A Describe the behavior of a system using conservation of angular momentum. 6.4.B Describe how the selection of a system determines whether the angular momentum of that system changes.	9.4 Rotational momentum

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Unit 6: Energy and Momentum of Rotating Systems (6 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
6.5 Rolling	6.5.A Describe the kinetic energy of a system that has translational and rotational motion. 6.5.B Describe the motion of a system that is rolling without slipping. 6.5.C Describe the motion of a system that is rolling while slipping.	9.1 Rotational kinematics 9.5 Rotational kinetic energy
6.6 Motion of Orbiting Satellites	6.6.A Describe the motions of a system consisting of two objects interacting only via gravitational forces.	7.9 Improving our model of gravitational potential energy

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Unit 7: Oscillations (4 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
7.1 Defining Simple Harmonic Motion (SHM)	7.1.A Describe simple harmonic motion.	10.1 Observations of vibrational motion 10.3 Dynamics of simple harmonic motion 10.5 The simple pendulum
7.2 Frequency and Period of SHM	7.2.A Describe the frequency and period of an object exhibiting SHM.	10.1 Observations of vibrational motion 10.3 Dynamics of simple harmonic motion 10.5 The simple pendulum
7.3 Representing and Analyzing SHM	7.3.A Describe the displacement, velocity, and acceleration of an object exhibiting SHM.	10.1 Observations of vibrational motion 10.2 Kinematics of vibrational motion 10.5 The simple pendulum
7.4 Energy of Simple Harmonic Oscillators	7.4.A Describe the mechanical energy of a system exhibiting SHM.	10.1 Observations of vibrational motion 10.4 Energy of vibrational systems 10.5 The simple pendulum

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Unit 8: Fluids (4 topics) AP® Physics 1 Course Framework		
Topic	**Learning Objectives**	**College Physics: Explore and Apply Chapters and Sections**
8.1 Internal Structure and Density	8.1.A Describe the properties of a fluid.	12.1 Structure of matter 12.2 Pressure, density, and the mass of particles 13.1 Density
8.2 Pressure	8.2.A Describe the pressure exerted on a surface by a given force. 8.2.B Describe the pressure exerted by a fluid.	12.2 Pressure, density, and the mass of particles 13.2 Pressure inside a fluid 13.3 Pressure variation with depth 13.4 Measuring atmospheric pressure
8.3 Fluids and Newton's Laws	8.3.A Describe the conditions under which a fluid's velocity changes. 8.3.B Describe the buoyant force exerted on an object interacting with a fluid.	13.5 Buoyant force 13.6 Skills for analyzing static fluid problems
8.4 Fluids and Conservation Laws	8.4.A Describe the flow of an incompressible fluid through a cross-sectional area by using mass conservation. 8.4.B Describe the flow of a fluid as a result of a difference in energy between two locations within the fluid–Earth system.	14.1 Fluids moving across surfaces - qualitative analysis 14.2 Flow rate and fluid speed 14.4 Bernoulli's equation 14.5 Skills for analyzing processes using Bernoulli's equation

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