Reavis High School
Physics Honors Curriculum Snapshot

Unit 1: Mathematical Toolkit

5 Days	Students will be able to: state definition for physics; measure length using a meter stick; measure the time with a stopwatch and photogates; convert between metric and standard measurements; be able to calculate absolute and relative error; be able to differentiate between accuracy and precision; be able to calculate relative and absolute error during an experiment; be able to caclulate propagation of error.

Unit 2: Linear Motion

15 Days	Students will be able to: state the definitions and units of velocity, instantaneous velocity, average velocity, speed, distance, displacement, and acceleration, free-fall gravity; be able to differentiate between scalar and vector quantities; be able to create and analyze velocity and acceleration graphs of motion; be able to calculate the initial and final velocities, time, displacement, and acceleration for a body that is experiencing 1D motion and uniform acceleration; be able to measure displacement, time, and velocity of a body experiencing 1D motion; be able to calculate acceleration based on measurements; memorize gravity's quantity; differentiate between free-fall and horizontal motion; calculate time and height for free-fall problems; be able to model 1D motion using technology.

Unit 3: Vectors

7-8 Days	Students will be able to: draw vectors tip to tail; add vectors graphically and mathematically; be able to use trigonometry to solve addition of vectors at angles other than at the horizontal and perpendicular; be able to use Pythagorean's Theorem to calculate the resultant of two vectors; be able to resolve vectors into their x and y components; be able to add and subtract more than two vectors each with different angles.

Unit 4: Projectiles

15 days	Students will be able to: state the definiton of projectile motion, parabolic motion, and two-dimensional motion; differentiate between motion in the Y plane and X plane; draw a picture of an object experiencing 2D motion; identify how the symmetry of a parabola is used to analyze 2D motion; solve for horizontal displacement and vertical displacement given an initial velocity at an angle when the launch and landing are at different heights; be able to use equations to predict where an object experiencing 2D motion will land during an experiment; describe how air resistance affects 2D motion and how it changes its parabolic nature; be able to represent 2D motion with a mathematical model.

Unit 5: Dynamics

15 Days	Students will be able to: state Newton's three laws, key physical quantities associated with each law, and any math sentences associated with the law; state definitions of normal force, applied force, friction force, tension force, air drag force; units for measure of force (Newton); state the difference between weight and mass and provide math sentences to describe the difference; be able to solve F = ma problems for each variable; be able to use trigonometry to solve forces at an angle problem; be able to draw a free-body diagram; calculate tension in two or more cables attached at different angles to a mass; calculate force and acceleration for bodies on an inclined plane; calculate tension when there are at least two different cables and a hanging mass.

Unit 6: Momentum

10 Days	Students will be able to: define momentum, impulse, elastic collision and inelastic collision; state conservation of momentum theory and its mathematical sentence; be able to differentiate among the types of collisions and write their correspodning math sentences; be able to calculate the starting state or ending state of objects experiencing elastic or inelastic collisions and do so when angles are involved; be able to differentiate amongst momentum, forces, and impulse using math sentences and mathematical relationships; be able to demonstrate different types of collisions in an experimental setting and that conservation of momentum is observed; be able to create a safety system that reduces the impulse of a body experiencing a change in momentum; create a model that describes the different types of collisions.

Unit 7: Rotational Motion

10 Days	Students will be able to: state the definition of rotational motion, angular motion, tangential velocity, centripetal acceleration and centripetal force, torque, center of mass, equilibrium; calculate centripetal force and tangential velocity given period of rotation, mass, or angle; write math sentences representing sums of torques involving at least four different masses; calculate sums of torques; create a system of at least four masses that is in equilibrium about a center of mass; be able to calculate centripetal force and centripetal acceleration.

Unit 8: Gravitation

10 Days	Students will be able to: state definitions for aphelion and perihelion, state Newton's Law of Gravitation mathematically; state Inverse Square Law mathematically; solve for gravitational forces given two different masses and distance between them; create a model that demonstrates the Inverse Square Law in terms of a model of gravitational forces; calculate escape velocity.

Unit 9: Work & Power

5 Days	Students will be able to: state definitions of work, power, joule, calorie; convert between joules and calories; represent work and power with math sentences; calculate work and power given force, distance, or time; evaluate the energy needed to sustain activity; evaluate caloric intake as it relates to work and power; create a model of energy conservation; evaluate work and power systems in terms of efficiency.

Unit 10: Energy

10 Days	Students will be able to: state defintions of energy, kinetic energy, gravitational potential energy, elastic potential energy, conservation of mechanical energy, Work Energy Theorem; be able to calculate velocity or height in conservation of energy problems; use Hooke's Law to calculate energy of a spring or rubberband; be able to calculate velocity at any point along an object's path that traverses various displacements and heights; evaluate energy systems in terms of efficiency; create a conservation of energy model.

Unit 11: Machines

5 Days	Students will be able to: state definition of efficiency and represent efficiency with a math sentence; mechanical advantage and its math representation; identify different simple machines including the pulley and inclined plane; calculate the work done on different pulley systems up to a seven-pulley system when given a force or length of string; create a simple machine that reduces the force needed to move an object over a distance or height; calculate efficiency of machine system.

Unit 12: Electricity

10 Days	Students will be able to: state definition of volt, electromotive force, current, amperes, resistance, ohms, capacitance, farads, inductance, battery; state Ohm's Law mathematically; calculate resistance, volts, or current using Ohm's Law; be able to add resistances, voltages, currents, and capacitances in series and parallel; describe the relationship between electricity and energy; be able to create an electrical circuit that has current, voltage, resistance, and capacitance and that does some kind of work; design a circuit using voltage, current, resistance, and capacitance.

Unit 13: Capstone Project

10 Days	Students will be able to: demonstrate their knowledge of physics in at least three different areas by creating an experiment, demonstration, device, or consulting service that requires research, speaking with professionals, and applying physics knowledge and the scientific process.