Course Title: Physics I / Honors Physics I
Board Approval Date: March 17, 2020
Credit / Hours: 1

Course Description:

Students will study motion, force, energy, rotational motion, fluids, waves, and electricity through both lecture and experimentation. This is a course in applied mathematics, and as a result algebra skills are required on a daily basis. Students entering college in either science or engineering are strongly encouraged to select this course.

Learning Activities / Modes of Assessment:

Large Group Instruction Guided Practice Small Group Projects Audio/Visual Media Computer Simulations Laboratory Experiments	Homework Problems Laboratory Reports Tests and Quizzes Teacher Observation

Adjustment for Honors Sections:

Honors sections will cover additional (~20%), more complex examples in each of the chapters. As a result, they will be assigned additional homework problems covering those examples and be assessed on a few of the more complex examples. All honors lab reports will be prepared individually, as opposed to occasional group submissions in regular sections.

Instructional Resources:

Holt Physics, 2002
Pasco lab equipment
DataStudio software
Microsoft Excel or similar software

Curriculum: Dover Area School District
Course: Physics I / Honors Physics I
Topic: The Science of Physics

Know:	Understand:	Do:
Vocabulary: Science Theory Law Accuracy Precision Significant Digits Controlled Experiment Order of Magnitude	Science has tools and conventions that are widely accepted. Understanding how to use these tools is an important part of doing good scientific work.	Identify areas of study in Physics Take measurements to the correct precision Perform Units Analysis Make order of magnitude calculations Do calculations with correct significant digits Graph data and analyze a set of data

Curriculum: Dover Area School District
Course: Physics
Topic: Motion in One Dimension

Know:	Understand:	Do:
Vocabulary: Frame of Reference Distance (d) Displacement (**d**) Speed Velocity (**v**) Average Velocity ($\mathbf{v}_{avg}$) Instantaneous Velocity Acceleration (**a**) Projectile Free Fall **Equations:** $d = \Delta x$ $v_{avg} = \frac{\Delta x}{\Delta t}$ $a_{avg} = \frac{\Delta v}{\Delta t}$ $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$ $v_f^2 = v_i^2 + 2a\Delta x$	The motion of objects can be described with a fairly small set of variables and equations. These relationships can be used to predict the outcome of systems.	Describe position and motion mathematically using a frame of reference Calculate displacements of objects with constant velocities Interpret graphs of displacement versus time and velocity versus time Apply kinematics equations to solve problems involving constant acceleration Calculate the motion of objects in free fall

Curriculum: Dover Area School District
Course: Physics
Topic: Two Dimensional Motion and Vectors

Know:	Understand:	Do:
Vocabulary: Vector Scalar Graphical Vector Addition Algebraic Vector Addition Resultant Projectile Motion Vector Resolution **New Equations:** $Sin\theta = \frac{O}{H}$ $Cos\theta = \frac{A}{H}$ $Tan\theta = \frac{O}{A}$ $R = \sqrt{R_x{}^2 + R_y{}^2}$ $v_{a/c} = v_{a/b} + v_{b/c}$	Vectors can be used to represent multi-dimensional quantities. Two dimensional systems can be solved using vector methods.	Know the difference between a scalar and a vector Add and subtract vectors both graphically and algebraically Resolve vectors into x and y components Solve projectile motion problems Solve relative motion problems

Curriculum: Dover Area School District
Course: Physics
Topic: Forces and the Laws of Motion

Know:	Understand:	Do:
Vocabulary: Coefficient of Friction (m) Equilibrium Force (F) Contact Force Field Force Net External Force (SF) Normal Force (F_N) Free Body Diagram Inertia Kinetic Friction (m_k) Static Friction (m_s) Weight (F_g) **New Equations:** $\sum F = ma$ $F_f = \mu F_N$ $F_W = mg$	Force, mass and acceleration are related and determine the motion of systems. Newton's Laws described these relationships.	Understand each of Newton's Laws Draw a correct free body diagram Solve problems using Newton's 2nd Law in one dimension Solve inclined plane problems Solve problems involving friction

Curriculum: Dover Area School District
Course: Physics
Topic: Work and Energy

Know:	Understand:	Do:
Vocabulary: Work (W) Joule (J) Power (P) Watt (W) Energy (E) Kinetic Energy (KE) Potential Energy (PE) Gravitational Potential Energy (PE_G) Elastic Potential Energy (PE_E) Mechanical Energy (ME) Spring Constant (k) Conservation of Energy Work-Kinetic Energy Theorem **Equations:** $W = Fd\cos\theta$ $KE = \frac{1}{2}mv^2$ $W = \Delta KE$ $PE_g = mgh$ $PE_{elastic} = \frac{1}{2}kx^2$ $ME = KE + PE$ $ME_i = ME_f$ $P = \frac{W}{t}$	Concepts of work and energy can be used to solve Physics problems in alternative ways, often making the problems easier. Conservation of energy is a universal concept that applies to many areas of science.	Calculate the work done on an object Determine the kinetic energy of an object in motion Determine the potential energy of an object (both gravitational and elastic) Use the work-kinetic energy theorem Solve conservation of energy problems Calculate the power required to do work

Curriculum: Dover Area School District
Course: Physics
Topic: Momentum and Collisions

Know:	Understand:	Do:
Vocabulary: Momentum (p) Impulse Elastic Collision Inelastic Collision Conservation of Momentum **New Equations:** $p = mv$ $F\Delta t = \Delta p$	Momentum is conserved during collisions and can be used to predict the outcome of systems.	Calculate the momentum of an object Calculate the change in an object's momentum due to an impulse Calculate the outcome of a linear elastic and inelastic collision

Curriculum: Dover Area School District
Course: Physics
Topic: Rotational Motion and Law of Gravity

Know:	Understand:	Do:
Vocabulary: Rotational Motion Radian (rad) Angular Displacement Angular Speed Angular Acceleration Tangential Acceleration (a_c) Centripetal Acceleration (a_t) Centripetal Force (F_c) Universal Gravitation **Equations:** $s = r\theta$ $v = r\omega$ $a = r\alpha$ $\omega_f = \omega_i + \alpha t$ $\theta = \omega_i t + \frac{1}{2}\alpha t^2$ $\omega_f^2 = \omega_i^2 + 2\alpha\theta$ $\theta = \frac{\omega_i + \omega_f}{2} t$ $a_c = \frac{v^2}{r}$ $F_c = \frac{mv^2}{r}$ $F_g = G\frac{m_1 m_2}{r^2}$	Rotational motion can be analyzed in a similar manner to linear motion. A small set of kinematics equations can be generalized to nearly all rotational motion.	Convert between tangential and angular quantities. Solve problems using angular kinematics. Solve problems involving centripetal acceleration. Solve problems involving universal gravitation.

Curriculum: Dover Area School District
Course: Physics
Topic: Rotational Dynamics

Know:	Understand:	Do:
Vocabulary: Torque (t) Moment of Inertia (I) Angular Momentum (L) Rotational Kinetic Energy Center of Mass (COM) Lever Arm (d) **Equations:** $\tau = Fd\sin\theta$ $\sum \tau = I\alpha$ $L = I\omega$ $KE_{rot} = \frac{1}{2}I\omega^2$	Concepts like linear energy, momentum, and mass have equivalents in rotational motion that can be used to solve systems.	Calculate the torque created by a force applied at a distance Solve problems involving extended objects in equilibrium Applying Newton's second law for rotating objects Calculate the angular momentum of an object Calculate the rotational energy of an object Solve conservation of energy and momentum problems involving rotating objects

Curriculum: Dover Area School District
Course: Physics
Topic: Fluid Mechanics

Know:	Understand:	Do:
Vocabulary: Density Bouyant Force Pressure (P) Pascal's Principle Bernoulli's Principle Temperature (T) Boltzmann's constant (k_b) **Equations:** $\rho = \frac{m}{V}$ $F_B = F_g = \rho V g$ $P = \frac{F}{A}$ $P = P_0 + \rho g h$ $A_1 v_1 = A_2 v_2$ $P + \frac{1}{2}\rho v^2 + \rho g h$ $PV = n k_B T$	Fluid systems can be analyzed using a small set of equations relating pressure, density, and velocity.	Determine the density of an object Determine the buoyant force on an object Solve Pascal's principle problems Solve Bernoulli's equation problems Solve problems with the ideal gas law

Physics I / Honors Physics I: Pacing Guide

Course: Physics I / Honors Physics I

Course Unit (Topic)	Length of Instruction (Class Periods)
1. The Science of Physics	10 days
2. One Dimensional Motion	10 days
3. Two Dimensional Motion and Vectors	10 days
4. Force and The Laws of Motion	10 days
5. Work and Energy	10 days
6. Momentum and Collisions	10 days
7. Rotational Motion and the Law of Gravity	10 days
8. Rotational Dynamics	10 days
9. Fluid Mechanics	10 days
	90 days