Content: Physical Science	**Grade or Course:** Lab Physics	**Date Developed:** 8/2018

Overview:

The business of physics is to study the interactions between matter and energy, so topics will include kinematics (motion), dynamics (forces), energy, light and basic electricity. Content is learned and practiced through hands-on activities that require observation, data collection, and analysis as well as applications to systems we won't directly observe (from draft horses pulling barges in England to the International Space Station). Along the way we will also be deepening skills in independent learning.

In the modern changing world all people need basic knowledge of core scientific concepts in order to be informed and engaged citizens, employees and consumers. Knowledge of scientific processes is important if students are to handle change and be flexible self-directed life-long learners. The skills of critical thinking, problem-solving and scientific creativity will guide students in evaluating and incorporating the impact of new science and technology within their personal lives and their communities.

Essential Questions:

- How can we describe, represent and measure the motion of objects?
- How can we use our knowledge of motion to describe and predict projectile motion?
- How can we describe, represent and measure forces on objects and between interacting objects?
- How can we use our knowledge of forces to explain and predict the results of collisions?
- How can we describe and represent transformations of energy in systems?
- How can we use our knowledge of energy transformations to explain and predict phenomena such as roller coasters?
- How can we describe, represent and measure waves in general and sound and light waves in particular?
- How can we use our knowledge of waves to explain and predict phenomena such as the Doppler Effect?
- How can we describe, represent and measure electric current?
- How can we use our knowledge of electric current to explain and construct a DC motor?

EO's addressed to proficiency level:

Students will understand, demonstrate, and be evaluated on the following Scientific Practices:

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Using Math and Computational Thinking
- Obtaining, Evaluating, and Communicating Information

Standards:

- Students will demonstrate the use of specific tools for active metacognition.
- Students will demonstrate the ability to plan, carry out, and evaluate the results of an engineering design problem. (NGSS Practice 1, 3, 4, 6)
- Students will demonstrate the ability to use a variety of mathematical tools for problem solving, including proportions and substitution.
- Students will demonstrate the ability to communicate their problem-solving process, including habitually "showing work".
- Students will demonstrate the ability to construct an effective explanation to scientific phenomena. (NGSS Practice 2, 4, 6).
- Students will demonstrate an understanding of how scientific models/theories are developed, tested, used, and discarded. (NGSS Practice 2)
- Students will demonstrate the ability to use graphs, particle diagrams, motion maps, force diagrams and circuit diagrams to model, explain and analyze phenomena.

HS - PS2 -1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

Units:

Unit 1	**Measurement & Speed**
Unit 2	**Velocity & Vectors**
Unit 3	**Acceleration**
Unit 4	**Projectile Motion**
Unit 5	**Newton's First Law**
Unit 6	**Newton's Second Law**
Unit 7	**Newton's Third Law**
Unit 8	**Momentum & Impulse**
Unit 9	**Energy**
Unit 10	**Waves & Sound**
Unit 11	**Light**
Unit 12	**Electricity and Motors**

EO Assessments:

- Maze Runner Engineering Challenge (NGSS 1, 2, 3, 4, 6, 8)
- Hovercraft Heavyweights Engineering Challenge (NGSS 1, 2, 3, 4, 6, 8)
- Newton's Law Lab (NGSS 1, 2, 3, 4, 6, 8)
- FunTown Packet (NGSS 2, 4, 5, 6)
- Scootterbot Engineering Challenge (NGSS 1, 3, 4, 6, 8)
- Kaleidoscope Engineering Challenge (NGSS 1, 3, 6, 8)