Unit 02A: Forces NJ NGSS

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **3**
Status: **Published**

Standards

- Use mathematical representations of phenomena to describe explanations. (HS-PS2-4) (HS-ESS1-4), (SLO 1, 2, 5 & 6)
- Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS2-6)
- Newton's second law accurately predicts changes in the motion of macroscopic objects. (SLO 1, 2 & 3)
- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.
- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space.
- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS2-4)
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS2-1),(HS-PS2-5)
- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. (HS-PS2-2)
- Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-PS2-6)
- Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-ESS1-4)
- Theories and laws provide explanations in science. (HS-PS2-1),(HS-PS2-4)
- Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-1),(HS-PS2-4)

http://www.state.nj.us/education/modelcurriculum/sci/physicsu2.shtml

SCI.9-12.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
SCI.9-12.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.
SCI.9-12.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.

SCI.9-12.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.

Essential Questions

- What underlying forces explain the variety of interactions observed?
- How do rules of motion in our universe affect objects?
- What rules determine the motion of an object?

Content / Skills

- Define, apply, and calculate weight, normal, and frictional forces. (Accelerated & CP)
- Describe how force affects the motion of an object. (Accelerated & CP)
- Interpret and construct free-body diagrams. (Accelerated & CP)
- Explain the relationship between the motion of an object and the net force acting on the object. (Accelerated & CP)
- Determine the net external force on an object. (Accelerated & CP)
- Calculate the force required to bring an object into equilibrium. (Accelerated & CP)
- Describe an object's acceleration in terms of its mass and the net force acting on it. (Accelerated & CP)
- Predict the direction and magnitude of the accelerationcaused by a known net force. (Accelerated & CP)
- Identify action-reaction pairs. (Accelerated & CP)
- Explain the difference between mass and weight. (Accelerated & CP)
- Find the direction and magnitude of normal forces. (Accelerated & CP)
- Describe resistances as a forms of friction. (Accelerated & CP)
- Explain and calculate the differences between static and kinetic friction. (Accelerated & CP)
- Define and apply the centripetal force and acceleration. (Accelerated & CP)
- Define and apply the concepts of circular motion, centripetal acceleration and force. (Accelerated & CP)