Unit 01A: Motion NJ NGSS

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

Standards

- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS2-1),(HS-PS2-3)
- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (SLO 1, 2 & 3), (HS-PS2-1)
- Use mathematical representations of phenomena to describe explanations. (SLO 1, 2 & 4), (HS-PS2-2)
- Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. (HS-PS2-3)
- Newton's second law accurately predicts changes in the motion of macroscopic objects. (SLO 1, 2 & 3),(HS-PS2-1)
- Momentum is defined for a particular frame of reference; it is the mass times the velocity of the object. (SLO 5),(HS-PS2-2)
- If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PS2-2),(HS-PS2-3),(SLO 5)
- Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (secondary to HS-PS2-3)
- Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-PS2-3)
- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS2-1)
- Systems can be designed to cause a desired effect. (HS-PS2-3)
- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined. (HS-PS2-2)
- Theories and laws provide explanations in science. (HS-PS2-1)
- Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-1)

http://www.state.nj.us/education/modelcurriculum/sci/physicsu1.shtml

SCI.9-12.HS-PS2	Motion and Stability: Forces and Interactions
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-PS2-1	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

- How can I use the scientific method in my everyday life?
- How is scientific inquiry used as a tool to understand the world?
- How do we describe the motion of an object?
- Can we predict the motion of an object?
- What rules determine the motion of an object?
- How can one predict an object's continued motion, changes in motion, or stability?

Content / Skills

- Use the scientific method to create an experiment. (Accelerated & CP)
- Explain the scientific use of the word theory vs. the every day use. (Accelerated & CP)
- Solve a physical problem applying math and the scientific method. (Accelerated & CP)
- Identify and use science skills to solve problmes and answer questions. (Accelerated & CP)
- Describe how to use sceintific method to solve a problem. (Accelerated & CP)
- Identify basic SI (metric units) and the quantities they describe. (Accelerated & CP)
- Convert metric units. (Accelerated & CP)
- Interpret data in tables and graphs. (Accelerated & CP)
- Recognize equations as mathemtical relationships in graphical data. (Accelerated & CP)
- Distinguish between science and religion. (Accelerated)
- Distinguish between scientific problems and technological (Engineering) problems. (Accelerated)
- Describe motion in terms of frame of reference, displacement, time, and velocity. (Accelerated & CP)
- Solve average velocity problems. (Accelerated & CP)
- Construct and interpret position versus time graphs. (Accelerated & CP)
- Solve average acceleration problems. (Accelerated & CP)
- Construct and interpret velocity versus time graphs. (Accelerated & CP)
- Solve free fall problems. (Accelerated & CP)
- Graph and analyze the motion of an object. (Accelerated & CP)
- Design, Construct, and Test a functioning self propelled vehicle from limited materials. (Accelerated & CP)
- Measure and Calculate the average velocity of the vehicle. (Accelerated & CP)
- Calculate the displacement of an object traveling at a known velocity for a specific time interval. (Accelerated & CP)
- Construct and interpret graphs of position verses time. (Accelerated & CP)
- Differentiate between speed and velocity.(Accelerated & CP)
- Describe motion in terms of changing velocity. (Accelerated & CP)
- Compare graphical representations of accerated and nonaccelerated motions.(Accelerated & CP)
- Appy kinematic equations to calculate distance, time, or velocity under conditions of constant acceleration. (Accelerated)
- Explain why objects accelerate during free-fall. (Accelerated & CP)
- Recognize examples of projectile motion. (Accelerated & CP)
- Describe the path of a projectile as a parabola. (Accelerated & CP)
- Understand the nature of motion of an object moving in a straight line path. (Accelerated & CP)

- Determine the path of an object moving in a gravitational field. (Accelerated & CP)