

Unit 02C: Universal Gravitation NJ NGSS

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

Standards

- Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. (HS-PS2-4)
- Kepler's laws describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. (HS-ESS1-4), (SLO 6)

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

SCI.9-12.HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative position of particles (objects).
SCI.9-12.HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
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

- Explain the evolution of the universe from the Big Bang to the present. (Accelerated)
- Define the evolution of stars and their life cycles. (Accelerated)
- Cosmology of the expanding universe. (Accelerated)
- Black Holes and other death states for celestial objects. (Accelerated)
- Calculate Gravitational Force using Newton's Universal law of gravitation. (Accelerated)
- Understand the nature of an inverse square law. (Accelerated & CP)
- Define and apply the centripetal force and acceleration. (Accelerated & CP)

- Define and apply Newton's law of universal gravitation. (Accelerated & CP)
- Define and apply Kepler's laws. (Accelerated)
- Compare and contrast revolving and rotating. (Accelerated)
- Define and apply the concepts of circular motion, centripetal acceleration and force. (Accelerated)
- Define and apply the concept of center of mass. (Accelerated)
- Describe the history of cosmology that led to Newton's Theory of Gravity. (Accelerated)
- Use Newton's laws to describe orbital motion. (Accelerated)
- Find the force of gravity between masses. (Accelerated)
- Calculate and describe gravitational potential energy. (Accelerated)
- Relate Kepler's laws to conservation laws, (Accelerated)