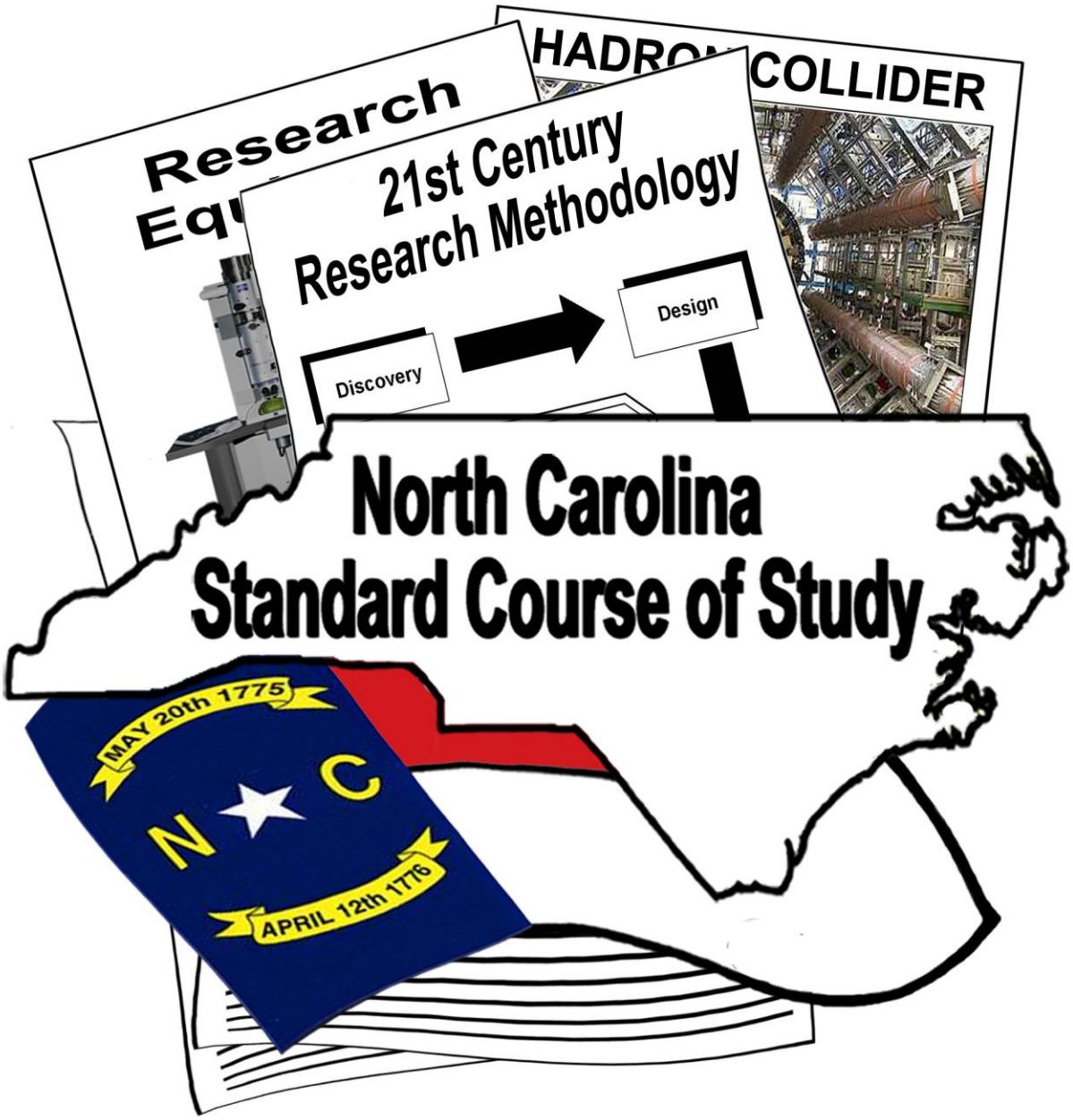
Cumberland County Schools

Curriculum Guide

Physics



High School Level

PHYSICS

Science, by nature, is an inquiry-based discipline whereby students gain knowledge through observation and experimentation. Scientific investigations involve collection of relevant evidence, use of logical reasoning, application of imagination to devise hypotheses, and explanations to make sense of collected evidence. The process skills of scientific inquiry support development of reasoning and problem-solving ability and are the core of scientific methodologies.

The high school Physics curriculum encompasses the following three strands: Forces and Motion; Energy: Conservation and Transfer; and Interactions of Matter and Energy. Students begin with an introduction to scientific measurement and the process of scientific inquiry. In the Forces and Motion strand, students will analyze the motion of objects as well as systems of forces and their interaction with matter. In the Energy: Conservation and Transfer strand, the concepts of work, energy, and power and the analysis of the behavior of waves will help students expand their knowledge of the concept of energy. In the Interactions of Energy and Matter strand, charges and electrostatic systems will be used to explain the interaction of energy and matter. By the end of the year, students will have developed a depth of understanding of Physics that will prepare them for further study at the college level.

Forces and Motion

Analyze the motion of objects.

1. Analyze motion graphically and numerically using vectors, graphs, and calculations.
2. Analyze motion in one dimension using time, distance, displacement, velocity, and acceleration.
3. Analyze motion in two dimensions using angle of trajectory, time, distance, displacement, velocity, and acceleration.

Analyze systems of forces and their interaction with matter.

1. Analyze forces and systems of forces graphically and numerically using vectors, graphs, and calculations.
2. Analyze systems of forces in one dimension and two dimensions using free body diagrams.
3. Explain forces using Newton's Laws of Motion as well as the Universal Law of Gravitation.
4. Explain the effects of forces (including weight, normal, tension, and friction) on objects.
5. Analyze basic forces related to rotation in a circular path (Centripetal Force).

Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy, and impulse.

1. Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy.
2. Analyze the motion of objects based on the relationship between momentum and impulse.

Energy: Conservation and Transfer

Understand the concepts of work, energy, and power, as well as the relationship among them.

1. Interpret data on work and energy presented graphically and numerically.
2. Compare the concepts of potential and kinetic energy and conservation of total mechanical energy in the description of the motion of objects.
3. Explain the relationship among work, power, and energy.

Analyze the behavior of waves.

1. Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity.
2. Analyze wave behaviors in terms of transmission, reflection, refraction, and interference.
3. Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light).

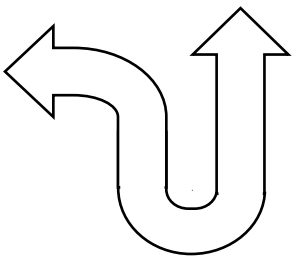
Analyze the nature of moving charges and electric circuits.

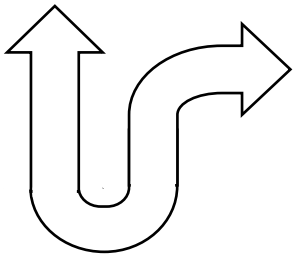
1. Explain Ohm's law in relation to electric circuits.
2. Differentiate the behavior of moving charges in conductors and insulators.
3. Compare the general characteristics of AC and DC systems without calculations.
4. Analyze electric systems in terms of their energy and power.
5. Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current, and resistance.

Interactions of Matter and Energy

Explain charges and electrostatic systems.

1. Explain qualitatively the fundamental properties of the interactions of charged objects.
2. Explain the geometries and magnitudes of electric fields.
3. Explain how Coulomb's law relates to the electrostatic interactions among charged objects.
4. Explain the mechanisms for producing electrostatic charges, including charging by friction, conduction, and induction.
5. Explain how differences in electrostatic potentials relate to the potential energy of charged objects.





Explain the concept of magnetism.

1. Explain the relationship between magnetic domains and magnetism.
2. Explain how electric currents produce various magnetic fields.
3. Explain how transformers and power distributions are applications of electromagnetism.