A Planned Course of Study

for

Active Physics

ASHS Course #0431

Abington School District

Abington, Pennsylvania

September 2016

ACTIVE PHYSICS PLANNED COURSE OF STUDY

I. Objectives

Students will demonstrate a level of proficiency in each of the following areas related to Physics:

A. Unifying Themes

1. Students will appropriately use measuring tools to collect quantitative data.
2. Students will explain how Newton's Laws of Motion govern the basic movement of objects.

B. Force & Motion of Particles and Rigid Bodies

1. Students will analyze the safety of traffic intersections.
2. Students will explain how safety devices in vehicles contribute to avoiding injuries.

C. Nature of Waves

1. Students will describe how sound and light are used and manipulated in communication technologies.
2. Students will explain how mirrors and lenses are used to produce images.

D. Electrical & Magnetic Energy

1. Students will explain how electricity is generated and used in the home.
2. Students will explain the connection between electricity and magnetism and build an electric motor.

E. Energy Storage & Transformations

1. Students will use knowledge of force and force factors.
2. Students will distinguish between kinetic and potential energy.
3. Students will explain and quantify concept of momentum.
4. Students will use mathematics to describe the behavior of waves.

F. Reading and Writing in Science and Technical Subjects

1. Key Ideas and Details
2. Integration of Knowledge and Ideas
3. Text Types and Purposes

II. Major Concepts

A. Unifying Themes

1. Scientific Measurement

a. Identifying Illusions and how to avoid them through quantitative measurement
b. Making measurements using appropriate tools and calibrations
c. Identifying patterns in data and observations
d. Distinguishing between random and predictable events using probability
e. Using indirect measurement when direct methods of measurement are unavailable

2. Newton's Laws of Motion

a. Applying Newton's 1st Law (inertia) to the motion of a "frictionless" object
b. Measuring the velocity of objects
c. Measuring acceleration of objects
d. Identifying the relationship between an object's mass and acceleration (2nd Law)
e. Recognizing action-reaction pairs in interactions between objects (3rd Law)

B. Force & Motion of Particles and Rigid Bodies

1. Driving the Roads

a. Measuring human response time
b. Graphing the motion of moving objects
c. Determining appropriate following distances for vehicles
d. Analyzing intersections. GO Zones & STOP Zones.
e. The role of friction when driving on curved roads
f. The advantage of banking on curved roads

2. Transportation Safety

a. Distinguishing between myths and reality about accidents
b. Investigating seatbelts and their efficacy based on Newton's 1st Law
c. Describing how different seatbelt designs manipulate pressure during an accident
d. Determining how air bags decrease the force on occupants using concepts of momentum and impulse
e. Exploring additional safety designs for vehicles: crumple zones

C. Nature of Waves

1. Waves in Communication Technology

a. Identifying basic properties of mechanical waves: wavelength, frequency
b. Identifying how sounds is manipulated to produce different pitches on a string or in an air column
c. Investigating reflection of light from flat mirrors
d. Investigating refraction of light through different mediums
e. Explaining how colors of light combine

2. Optics

a. Investigating properties and uses of curved mirrors
b. Investigating properties and uses of lenses

D. Electrical & Magnetic Energy

1. Electricity

a. Creating electrical energy from mechanical energy using hand generators
b. Distinguishing between parallel and series circuits
c. Exploring electrical power and load limits on circuit breakers and fuses.
d. Exploring the use of switches in electrical circuits
e. Determining the cost of electrical energy to run different appliances
f. Determining the efficiency of different heating appliances

2. The Electricity Magnetism Connection

a. Investigating magnetism and magnetic fields
b. Creating magnetic fields from electrical currents
c. Using the motion of magnets to induce an electrical current
d. Building an electrical motor

E. Energy Storage & Transformations

1. Amusement Park Physics

a. Applying knowledge of mechanics, waves, electricity and magnetism to analyzing amusement park rides mathematically
b. Describing and explaining the sensations felt by amusement park riders using physics terms and concepts

F. Reading and Writing in Science and Technical Subjects

1. Key Ideas and Details
2. Integration of Knowledge and Ideas
3. Text Types and Purposes

III. Instruction

A. Course Schedule

1. 5 days a week, for full year, 48 minutes per period

B. Pacing

1. Marking Period 1: Predictions Chapter 1, Predictions Chapter 2
2. Marking Period 2: Transportation Chapter 1, Transportation Chapter 2
3. Marking Period 3: Communications Chapter 1Part 1, Communications Chapter 1Part 2
4. Marking Period 4: Home Chapter 2, Home Chapter 3, Amusement Park Physics

C. Methods

1. Hands-on labs will the main method of instruction
2. Visual aids will be used throughout the course
3. Demonstrations of concepts
4. Cooperative learning activities will be employed
5. Writing will be used to sum up each activity
6. Student reading from the text will be an integral part of the course
7. Projects
8. On-line simulations
9. Supplementary materials will be used

D. Technology

1. Virtual labs/simulations will be incorporated
2. Use of computers will be incorporated into the course for graphing and problem solving
3. Lab Quests (computer based labs) will be used

E. Resources

1. Texts:

a. Eisenkraft, A. E. (2000). *Active Physics: Predictions*. Armonk, NY: It's About Time, Inc.

b. Eisenkraft, A. E. (2000). *Active Physics: Transportation*. Armonk, NY: It's About Time, Inc.

c. Eisenkraft, A. E. (2000). *Active Physics: Communication*. Armonk, NY: It's About Time, Inc.

d. Eisenkraft, A. E. (2000). *Active Physics: Home*. Armonk, NY: It's About Time, Inc.

2. Videos:

a. Video are included with the Active Physics curriculum. Video titles are listed in the equipment lists found in each Teacher's Edition.

IV. Assessment

A. Procedures for Evaluation

1. Summative assessments
   a. A departmental common assessment will be administered at the end of each unit.
   b. A departmental common assessment will be administered at the end of the course.
2. Formative assessments will be administered in a variety of formats.
3. Accommodations aligned with those permitted in IEP's will be provided for Special Education students who are enrolled in this course.

B. Expected Levels of Achievement

Students are expected to achieve at least a minimum level of proficiency. Proficiency and related grades are defined as follows:

A……..90 – 100%
B……..80 – 89%
C……..70 – 79%
D……..60 – 69%