Northampton Area School District
Honors Physics "Year at a Glance"
Board Approval Date: August 27, 2018

Common Units of Study	Textbook Chapter(s)	Estimated % of Course Time	Estimated Time	Big Ideas/Topics	PA Academic Standard(s)
Unit 1: ● Kinematics	1, 2, 3	17%	6 weeks	**Big Idea 1:** Objects and systems have properties such as mass and charge. Systems may have internal structure. ● Vectors/Scalars ● One dimensional motion (including graphing motion) ● Two dimensional motion	**3.2.P.B1:** ● Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity, and acceleration.
Unit 2: ● Dynamics	4	17%	6 weeks	**Big Idea 1**: Objects and systems have properties such as mass and charge. Systems may have internal structure. **Big Idea 2:** Fields existing in space can be used to explain interactions. **Big Idea 3:** The interactions of an object with other objects can be described by forces. **Big Idea 4:** Interactions between systems can result in changes in those systems. ● Forces ● Newton's Laws of Motion	**3.2.10.B1:** ● Analyze the relationships among the net forces acting on a body, the **mass** of the body, and the resulting acceleration using Newton's Second Law of Motion. ● Use Newton's Third Law to explain forces as interactions between bodies.
Unit 3: ● Energy	5	11%	4 weeks	**Big Idea 3:** The interactions of an object with other objects can be described by forces. **Big Idea 4:** Interactions between systems can result in changes in those systems. **Big Idea 5**: Changes that occur as a result of interactions are constrained by conservation laws. ● Work ● Energy ● Conservation of Energy ● Power	**3.2.10.B2:** ● Explain how the overall energy flowing through a system remains constant. ● Describe the work-energy theorem. ● Explain the relationships between work and power.

Unit 4: ● Momentum	6	11%	4 weeks	**Big Idea 3:** The interactions of an object with other objects can be described by forces. **Big Idea 4:** Interactions between systems can result in changes in those systems. **Big Idea 5**: Changes that occur as a result of interactions are constrained by conservation laws. ● Impulse ● Momentum ● Conservation of Momentum	**3.2.10.B1:** ● Describe how interactions between objects conserve momentum. **3.2.12.B2:** ● Explain how energy flowing through an open system can be lost. ● Demonstrate how the law of conservation of momentum and conservation of energy provide alternate approaches to predict and describe the motion of objects.
● Circular Motion	7	11%	4 weeks	**Big Idea 1**: Objects and systems have properties such as mass and charge. Systems may have internal structure. **Big Idea 2:** Fields existing in space can be used to explain interactions. **Big Idea 3:** The interactions of an object with other objects can be described by forces. **Big Idea 4:** Interactions between systems can result in changes in those systems. ● Universal Law of Gravitation ● Circular Motion	**3.2.10.B1:** ● Apply Newton's Law of Universal Gravitation to the forces between two objects. 3.2.P.B1 ● Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity, and acceleration.
Unit 6: ● Rotation	8	11%	4 weeks	**Big Idea 3:** The interactions of an object with other objects can be described by forces. **Big Idea 4:** Interactions between systems can result in changes in those systems. **Big Idea 5**: Changes that occur as a result of interactions are constrained by conservation laws. ● Rotational Kinematics ● Rotational Energy ● Torque and Rotational Dynamics ● Angular Momentum ● Conservation of Angular Momentum	**3.2.12.B1:** ● Analyze the principles of rotational motion to solve problems relating to angular momentum and torque. **3.2.P.B1:** Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity, and acceleration.

Unit 7: ● Simple harmonic motion, Mechanical Waves and Sound	12, 13	11%	4 weeks	**Big Idea 3:** The interactions of an object with other objects can be described by forces. **Big Idea 5**: Changes that occur as a result of interactions are constrained by conservation laws. **Big Ideas 6:** Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena. ● Simple Pendulums ● Mass-Spring Oscillators ● Mechanical Waves ● Sound	**3.2.10.B5:** ● Understand that waves transfer energy without transferring matter. ● Compare and contrast the wave nature of light and sound. ● Describe the components of the electromagnetic spectrum. ● Describe the difference between sound and light waves. **3.2.P.B5:** ● Explain how waves transfer energy without transferring matter. ● Explain how waves carry information from remote sources that can be detected and interpreted. ● Describe the causes of wave frequency, speed, and wave length.
Unit 8: ● Electrostatics and Circuits	19, 20	11%	4 weeks	**Big Idea 1**: Objects and systems have properties such as mass and charge. Systems may have internal structure. **Big Idea 3:** The interactions of an object with other objects can be described by forces. **Big Idea 5**: Changes that occur as a result of interactions are constrained by conservation laws. ● Electric Charge ● The Law of Conservation of Electric Charge ● Electrostatic Forces ● Ohm's Law ● Kirchhoff's Laws ● Simple DC Circuits	**3.2.10.B4:** ● Describe quantitatively the relationships between voltage, current, and resistance to electrical energy and power. ● Describe the relationship between electricity and magnetism as two aspects of a single electromagnetic force. **3.2.P.B4** ● Explain how stationary and moving particles result in electricity and magnetism. ● Develop qualitative and quantitative understanding of current, voltage, resistance, and the connections among them. ● Explain how electrical induction is applied in technology.