Northern York County School District Curriculum

Course Name:	AP Physics 4700
Content:	Kinematics
Key Learning(s):	Quantifying both accelerated motion and constant velocity motion.
Essential Question(s):	What are the different quantities that describe motion? How can position, velocity and the acceleration of objects be quantified? How are motion graphs analyzed?
Grade Level:	12 Grade

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12.C 3.1.12.B	Apply the principles of motion and force Apply concepts of as a method to predict and understand science	Classroom discussion and demonstrations. Students will solve problems involving motion. Students will analyze graphs of motion. Students will analyze video of the motion of cars and other moving objects. Students will perform virtual labs simulating motion. View video “The Law of Falling Bodies”	Homework problems will be evaluated. Lab reports will be evaluated. Problem solving test will be evaluated	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Motion in Two Dimensions
Key Learning(s):	Learn to model and predict various quantities related to the motion of a projectile. Analyze circular and planetary motion.
Essential Question(s):	Why is the path of a projectile a parabola? How can the height, horizontal distance and time in the air be determined? What role does circular motion play in the structure of the solar system?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.12. C 3.4.14.D	Apply the principles of motion and force Analyze the essential ideas About the structure of the universe	Classroom discussion and demonstrations. Students will solve problems involving motion in two dimensions. Students will view projectile and circular motion. Students will analyze the motion of the planets and other celestial objects. Students will perform virtual labs on planetary motion and projectile motion. Students will view video “The Apple and the Moon” & “Moving in Circles”	Homework Problems Written Reports. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Forces
Key Learning(s):	Analyze how various forces affect the motion of an object.
Essential Question(s):	What relationship exists between force and acceleration? How does friction influence the motion of an object? What forces are involved when an object is on a sloped surface?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C	Observe and describe different types of force and motion Apply the principles of motion and force	Classroom discussion and demonstrations. Students will solve problems involving various forces Instructor will analyze and solve sample problems Students will analyze the forces on objects on an incline plane. Students will solve problems with classmate at board Students will perform virtual labs force and its influence on motion. Students will view video “Newton’s Laws”	Homework Problems Written Reports. Problem solving test. Classroom problem solving.	Textbook AP Physics Guidebook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Momentum
Key Learning(s):	Analyze momentum and energy in collisions and explosions
Essential Question(s):	How is momentum quantified? Is momentum conserved in one dimension? two dimensions? Is mechanical energy conserved in collisions?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.10.B	Observe and describe different types of force and motion Apply the principles of motion and force Analyze energy sources and transfers of heat	Classroom discussion. Students will solve problems involving momentum in collisions and explosions. Students will perform lab on collisions in two dimensions Students will analyze video of collisions in two dimensions Students will view video “Conservation of Momentum”	Homework Problems Written Reports. Problem solving test.	Textbook AP Physics Guidebook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Collision in Two dimensions Apparatus The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Angular Motion
Key Learning(s):	The kinematics and dynamics of rotational motion.
Essential Question(s):	How do you describe rotational motion? How does shape influence an objects rotational inertia? How is angular motion quantified?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Demonstrations involving rotational inertia. Lab on factors that contribute to torque. Students solve problems determining moments of inertia for different shaped objects. Students solve problems relating to angular motion and angular acceleration. Students learn to apply principles of energy conservation to rotational systems. Students will view video “Angular Momentum” & “Torques and Gyroscopes”	Homework Problems Written Reports. Problem solving test. Lab reports.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Rotational motion discs The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Equilibrium
Key Learning(s):	The relationship between force, torque and equilibrium.
Essential Question(s):	What conditions must be met for equilibrium to exist? How to determine if equilibrium exists? How can the conditions of equilibrium be applied to complex systems?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.2.12.C 3.2.12.B	Apply the elements of scientific inquiry to solve multi-step problems Evaluate experimental information for appropriateness and adherence to relevant science processes	Classroom discussion. Demonstrations of systems in equilibrium. Lab experiments determining conditions of equilibrium. Construction of free body diagrams. Students will solve complex problems involving equilibrium. Students will analyze structures for maintaining equilibrium.	Homework Problems Written Reports. Problem solving test. Lab reports.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Hooke's Law and Simple Harmonic Motion
Key Learning(s):	Learn the dynamics of simple harmonic motion
Essential Question(s):	What is Hooke's Law? What conditions must be met for a system to be a simple harmonic oscillator? How do energy conservation principles relate to a SHO?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.4.B	Observe and describe different types of force and motion Apply the principles of motion and force Know basic energy types, sources and conversions	Classroom discussion. Lab experiment Hooke's Law. Demonstration of Simple Harmonic Motion. Discussion of how a pendulum is a SHO. Students use conservation of energy principles to determine velocity and frequency of a SHO. Students will view video "Harmonic Motion"	Lab experiment evaluated. Homework problems evaluated. Problem solving test.	Textbook Physics of Motion Hooke's Law Apparatus Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Fluid Mechanics
Key Learning(s):	Learn the kinematics and dynamics of fluid flow.
Essential Question(s):	What principles determine whether objects float or sink? What is pressure and what factors determine pressure? How does pipe diameter affect fluid velocity? How does conservation of energy apply to fluid flow?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Classroom discussion. Venturi tube demonstration. Students will learn to apply Bernoulli's Principle to complex fluid problems. Students will use Archimedes principle to determine if objects will float or sink. Students will view video "Math Under Pressure" and & "Sailing thru Bernoulli"	Evaluation of homework problems. Problem solving at whiteboard evaluated. Problem based text.	Textbook Venturi tube Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board ESPN Sports Figures Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Ideal Gas Law
Key Learning(s):	Learn how to apply Boyle's, Charles and the Ideal Gas Law to determine different states of a gas.
Essential Question(s):	How do pressure, temperature and volume relate to each other? How do the macroscopic properties of a gas relate to the microscopic quantities?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.12.A 3.2.12.B 3.4.12.B	Apply concepts about the structure and properties of matter Evaluate experimental information for appropriateness and adherence to relevant science processes Apply and analyze energy sources and their conversions and their relationship to heat and temperature.	Students will perform Boyles Law experiment Students will perform Charles Law experiment Classroom discussion. Students will solve problems using Ideal Gas Law. Students will view Ideal Gas Model Demonstration of Ideal Gas Law Principles Students will view video "Temperature and Gas Laws"	Lab Reports. Homework will be accessed. Problem solving test.	Textbook Boyles Law Apparatus Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Heat
Key Learning(s):	Learn to distinguish between heat and temperature and the law of conservation of energy applies to mixtures.
Essential Question(s):	How does heat differ from temperature? How is heat energy shared when materials having different temperatures are mixed? How much heat is needed for a material to change its phase?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.12.A 3.2.12.B 3.4.12.B	Apply concepts about the structure and properties of matter Evaluate experimental information for appropriateness and adherence to relevant science processes Apply and analyze energy sources and their conversions and their relationship to heat and temperature.	Students will perform experiment to determine the specific heat of different materials. Students will perform experiments on phase changes of H_2O. Students will solve mixture problems. Students will solve problems involving phase changes.	Lab reports will be evaluated. Problem solving techniques will be reviewed. Problem solving test.	Textbook Calorimeters, Specific Heat Samples, Heaters and Thermometers Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Thermal Physics
Key Learning(s):	Relationship between heat, work and internal energy.
Essential Question(s):	How is thermodynamic work quantified? How is heat energy used to do work? How do heat and internal energy relate?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.12.A 3.4.12.B	Apply concepts about the structure and properties of matter Apply and analyze energy sources and their conversions and their relationship to heat and temperature.	Classroom demonstration on conversion of work to heat. Students view demonstration of working heat engine. Classroom discussion. Students will work problems on heat and work. Students will work problems on internal energy.	Problem solving techniques will be reviewed. Problem solving test.	Textbook Sterling Heat Engine Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Combustion apparatus

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Electrostatics
Key Learning(s):	Learn how electrical charges interact and how to determine electric field strength.
Essential Question(s):	What force exists between two charged particles? How is electric field strength quantified? How is electrical potential determined?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Demonstrations involving electrical fields of point charges and linear charge distributions. Student will solve problems involving forces between point charges. Students will perform problems calculating electric fields. Students will determine electrical potential of various charge arrangements. Computer simulations of charges in electric fields. Students will view video “Static Electricity” and “The Electric Field”	Homework problems will be evaluated. Virtual lab E-fields will be evaluated. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Milikan apparatus. Van de Graff Generator The Mechanical Universe and Beyond Video Series Pith balls, rabbit fur and plastic rods. Electroscope

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Capacitors
Key Learning(s):	Learn how are capacitors used to store charge and electrical energy.
Essential Question(s):	What affect do capacitors have on electrical circuits? How do dielectrics affect the ability of capacitors to store charge? What different ways can multiple capacitors be connected in electrical circuits?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Classroom demonstrations with capacitors and dielectrics. Students will perform laboratory investigation using capacitors. Students will analyze electrical circuits consisting of capacitors. Students will view video “Potential and Capacitance”	Lab report will be evaluated. Homework problems will be evaluated. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Capacitors/galvonameter The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Electrical Circuits
Key Learning(s):	Learn how to determine voltage and current in parallel and series circuits.
Essential Question(s):	How do you determine voltage drops in parallel and series circuits? How do you determine current in parallel and series circuits? How can conservation of energy be used to analyze electrical circuits?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Classroom lecture. Students will calculate value of current for resistors in series and parallel circuits. Students will calculate value of voltages for circuits with both series and parallel elements. Laboratory investigation of electrical circuits. Apply Kirchoff's loop rules to evaluate electrical circuits Students will view video "Electric Currents".	Homework checked. Laboratory reports evaluated. Circuit construction evaluated. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Power Sources Resistors & Capacitors The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Magnetism
Key Learning(s):	Learn how magnetism and electric current are related.
Essential Question(s):	What relationship exists between magnetism and electric current? What is the magnetic field of a current carrying wire? What forces are exerted on charged particles when they move through a magnetic field?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Demonstration of the affect of a magnetic field on a moving charge. Laboratory experiment where students measure the magnetic field of a wire. Demonstrations of induction. Laboratory experiment where students determine the force on a wire placed in a magnetic field. Students solve problems involving force on charged particles moving through magnetic fields Students calculate magnetic fields of different electrical configurations. Demonstration of how principles of electromagnetism relate to televisions Students will view video on “Magnetism” and “The Magnetic Field”.	Homework problems evaluated. Laboratory reports are evaluated. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Solenoid, Power Sources, Magnets, Amps Law apparatus and Oscilliscope The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	AC Electricity
Key Learning(s):	Learn how AC circuits work.
Essential Question(s):	How do capacitors affect AC circuits? What are inductors and how do they affect electrical circuits? What is impedance and how is it calculated? How does frequency affect a circuit? What is electrical resonance?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Classroom discussion. Demonstration of capacitors in AC circuits. Demonstrations of inductors in AC circuits Students calculate impedance. Students measure impedance and determine how it varies with frequency. Students draw phasor diagrams. Definition of high and low pass filters Students determine various characteristics of AC circuits. Students will view video “Alternating Currents”	Homework checked. Phasor diagrams reviewed. Laboratory investigation evaluated. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Inductors, capacitors and resonance apparatus. The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Geometrical Optics
Key Learning(s):	Learn how path of light rays are manipulated to form images.
Essential Question(s):	How does refraction affect images? What is the mirror/lens equation and how is it used to predict image location? What factors affect the characteristics of an image?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Classroom discussion. Students do ray diagrams to analyze image formation. Students will use ray boxes to study how curved mirrors and lenses affect the path of light rays. Students use lens and mirror equation to predict image nature and location.	Ray diagrams are evaluated for correctness. Lens/mirror equation problems are evaluated. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Ray Box Lenses and mirrors Glass blocks Laser

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Physical Optics
Key Learning(s):	Learn how light waves interact to product interference affects.
Essential Question(s):	Where will interference maximums and minimums occur? How do thin films form diffraction patterns?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Demonstration of diffraction patterns. Classroom discussion of the principles of diffraction. Laboratory experiment where students determine relationship between diffraction and wavelength. Students observe diffraction patterns formed by thin films. Students solve problems predicting where diffraction minimums and maximums will occur.	Homework checked and evaluated. Laboratory report evaluated. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Sodium Light Diffraction Grating

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Atomic and Nuclear Physics
Key Learning(s):	Learn about the wave particle duality.
Essential Question(s):	What are photons and how does their energy relate to their frequency? What is the wave particle duality? How does the wavelength of an electron relate to the structure of the atom?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.4 C 3.4.12.C 3.4.7.C	Observe and describe different types of force and motion Apply the principles of motion and force Identify and explain the principles of force and motion	Classroom discussion. Photoelectric Effect experiment. Student discussion of the model of the atom. Students examine the emergence of the wave particle duality. Students calculate the wavelength of the electron and the proton	Laboratory report for Photoelectric Effect evaluated. Homework checked. Problem solving test.	Textbook Physics of Motion Software Conceptual Physics Virtual Labs Laptops/Internet Smart Board Photoelectric Effect apparatus. Geiger Counter

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Relativity
Key Learning(s):	Learn the Theory of Relativity and its implications.
Essential Question(s):	Is time absolute? What conclusion can be made from the Michelson Morley experiment? What relationship exists between Space and Time?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.2.12 B 3.2.12 A	Evaluate experimental Information for appropriateness and adherence to relevant scientific processes Evaluate the nature of scientific and technological knowledge	Students learn about the Michelson Morley experiment. Students learn about the inconsistency of simultaneity and absolute space. Students calculate length contraction and time dilation. Students learn about relativistic mass and rest energy. Students will learn about mass energy equivalence. Students will view video “The Michelson Morley Experiment” and “Velocity and Time”	Homework evaluated. Problem solving test.	Textbook Conceptual Physics Virtual Labs Laptops/Internet Smart Board The Mechanical Universe and Beyond Video Series

Northern York County School District Curriculum

Course Name:	AP Physics
Content:	Origin of the Universe
Key Learning(s):	Learn about Big Bang Theory and the evidence that exists to support the Big Bang Theory.
Essential Question(s):	What is the present state of the Universe? How do we know that the universe is expanding? What do we know about the origin of the universe and how have we come to know it? What is the future of the universe?
Grade Level:	12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.12 D 3.2.12 B	Analyze the essential ideas about the composition and structure of the universe. Evaluate experimental information for appropriateness and adherence to relevant scientific processes	Classroom discussion. Students will view film “Creation of the Universe”. Students will read current scientific publications on the topic.	Essay test where students discuss origin of the universe citing scientific evidence	Textbook Conceptual Physics Virtual Labs Laptops/Internet Smart Board Film “Creation of he Universe”