Course: Applied Physics
Grade Level: 11 PS 1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size/amount of substance).

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
About Science / Physics	Explain the mathematics of science, scientific methods, attitude, and technology Explain the specifics of Physics, that it's the nature of motion, forces, energy, matter, heat, light, sound, and the structure of the atom.	Discussion regarding metric system, conversations Units for velocity, acceleration, Perform simple calculations on calculations	Metric charts, calculators, meter sticks	Homework, Quiz and Test
Mechanics	Explain Newton's First law of motion using previous scientists (Aristotle, Copernicus, and Galileo's) discoveries as a stepping-stone to Newton's discoveries. Explain net force, changes in motion are a result from force.	Coin on card over glass, Weight on string pull gradually, as opposed to pulling quickly.	Glass, coin, stiff card string, weight	Homework, Quiz and Test

Course: Applied Physics
Grade Level: 11 PS 1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size/amount of substance).

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Mechanics (continued)	Mechanical equilibrium explain that the net force on an object is zero. Supporting force explain that the upward force = to downward force,	Use a spring to demonstrate	Various springs with different tensions	Quiz

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Composition - The nature of Matter	Recognize and describe the structure of an atom and explain how the major components interact with one another. Recognize how elements are arranged in the periodic table, and explain how this arrangement illustrates the repeating patterns among elements with similar properties, such as the relationship between atomic number and atomic mass. Explain that neutrons and protons are made up of even smaller constituents.	Poster of Oxygen atom Identify inert gasses and sections of Periodic Table	Poster paper, markers Copy of Periodic Table	Homework, quiz and test Quiz on Periodic Table

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Composition - The nature of Matter (continued)	Define isotopes, recognize that most elements have two or more isotopes, and explain that although the number of neutrons has little affect on how the atom interacts with others, they do affect the mass and stability of the nucleus. **Scientific thought about atoms has changed. Using narratives or models of atoms provide evidence that changed our understanding of the atom and the development of the atomic theory. [PS1 (9-11) MAS+ NOS-2]** **Model and explain the structure of an atom or explain how an atom's configuration, particularly the outmost electron(s), determine how that atom can interact with other atoms.[PS1 (9-11) MAS + FAF-4]**	The atomic nature of matter Time line report on discoveries of atom	Practicing Physics Internet	Worksheet Report

Course: Applied Physics
Grade Level: 11 PS 2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Energy	Explain the definition of work as force times distance Power is work done per time interval and that the unit for power is watts Explain that all energy can be considered to be either kinetic energy, potential energy or the sum of the two. Provide examples of how kinetic and potential energy can be transformed from one to the other. Discuss the conservation of energy by explaining that energy cannot be created or destroyed.	Build simple machines to measure efficiencies and perform calculations to solve problems Energy worksheet Connect string to pendulum – release. Explain KE & PE of system	Incline plane, pulley system Practicing Physics Pendulum, string	Homework, Quiz Lab Reports and Test Worksheet

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Energy (continued)	Explain machines and how machines change the direction of forces. and work input equals work output.	Lab using pulleys to lift weights, lever/fulcrum	Multi-gang pulleys weights, lever , fulcrum	
	Explain to numerous sources of energy and the conversation of sun light to solar energy.	Solar cars lab	Solar panels, wheels, gears, motor.	Car
	Describe how the energy associated with atoms and molecules can be used to identify the substances they comprise and explain that each kind of atom or molecule can gain or lose energy only in particular discrete amounts.			
	Explain the range of the electromagnetic spectrum as it relates to both wavelength and energy, provide examples of pratical applications of the different wavelengths in the spectrum.	Poster with different wavelengths indicating where visible light would fall.	Poster paper, markers	Poster

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Energy (continued)	Recognize that the human eye can only see a narrow range of wavelengths within the electromagnetic spectrum; and explain how the variations of wavelength within that range of visible light are perceived as differences in color.	Continued from above	Poster	Poster
	Describe the relationship between heat and temperature, explaining that heat energy consists of the random motion and vibrations of atoms, molecules, and ions and that the higher the temperature, the greater the atomic or molecular motion.	Lab exercise on temperature and heat	Lab Book	Lab report
	Explain that waves, such as light, seismic, sound waves, have energy and can transfer energy when they interact with matter.			

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Energy (continued)	Explain that nuclear reactions convert a fraction of the mass of interacting particles into energy and release much greater amounts of energy than atomic interactions. Describe how electrons flow easily in some materials, such as metals, whereas in insulating materials, such as glass, they can hardly flow at all. **Using information provided about chemical changes, draw conclusions about the energy flow in a given chemical reaction (e.g., exothermic reactions, endothermic reactions) [PS2 (9-11) INQ+SAE -6]**	Heat Flow lab	Copper, glass insulation	Lab report

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Change	Recognize that atoms may be bonded together into molecules or formula units (crystalline solids) Recognize that atoms interact with one another by transferring or sharing electrons that are furthest from the nucleus and explain that the outer electrons govern the chemical properties of an element. Explain that compounds are formed through ionic and covalent bonding. **Explain relationships between and among electrical charges, magnetic fields, electromagnetic forces and atomic particles. [PS2 (9-11) SAE - 7]** **Use physical and chemical properties as determined through an investigation to identify a substance. [PS1 (9-11) INQ –1]** **Explain how properties of elements and the location of elements on the periodic table are related. [PS1 (9-11) POC -3]**	Lab exercise on atoms and bonding Analysis of Periodic Table	Lab book Periodic Table	Tests, Quizes. and reports

Course: Applied Physics
Grade Level: 11 PS 3 - The motion of an object is affected by force.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Linear Motion	Explain what is meant by relative motion using examples - earth is in motion a person riding past while we stand still compared to if we are in motion. Define the difference between average and instantaneous speed **Apply the concepts of inertia, motion and momentum to predict and explain situations involving forces and motion, including stationary objects and collisions.**	Worksheet on linear motion Worksheet on linear motion	Practicing Physics Practicing Physics	Homework, Quiz Lab Reports and Test

Course: Applied Physics
Grade Level: 11 PS 3 - The motion of an object is affected by force.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Linear Motion (continued)	**Explain the effects on wavelength and frequency as electromagnetic waves interact with matter (e.g., light diffraction, blue sky). [PS3 (9-11) SAE –10]**			
Newton's Second Law of Motion	Force causes acceleration and the effects of friction on an object as well as how the mass and weight affect acceleration pointing out the difference between mass and weight.	Lab pulling blocks up slope containing strips of different materials such as sandpaper/ Worksheet, Newton's second law of motion	Scales, board with different textures, block Practicing Physics	Homework, quiz, test and lab report

Course: Applied Physics
Grade Level: 11 PS 3 - The motion of an object is affected by force.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Newton's Second Law of Motion (continued)	Explain that acceleration is the relationship of net force and mass. Using a table define free fall from rest, as the time of fall increases so does the velocity acquired. Define that how far an objects falls is different from how fast it falls.	Have students make a chart of free-fall Throw a ball up in the air explaining /questioning changes in the rate of velocity each second	Poster board markers Ball	Report on aactivity
Newton's Third Law of Motion	Explain Newton's third law that objects exert opposite and equal forces on other objects. Recognize Actions and reactions discussing how equal and different masses affect the results	Lab using force vectors to find resultant force	Calculators. rulers protractors.	Homework, quizzes test and worksheet from vector lab

Course: Applied Physics
Grade Level: 11 PS 3 - The motion of an object is affected by force.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Newton's Third Law of Motion (continued)	Introduce force vectors and resultant Interpret and apply the laws of motion to determine the effects of forces on the motion of objects.	Worksheet, Newton's third law of motion	Practicing Physics	Worksheet
Continuation of Newton's third law as Momentum and Impulse	Define momentum -mass of an object and it's velocity **Given information (e.g., graphs data, diagrams) use the relationships between or among force, mass, velocity, momentum, acceleration to predict and explain the motion of objects.[**PS3 (9-11) INQ + POC - 8**]**	Lab using resultant and force vectors Momentum worksheet	Practicing Physics	Homework, Quiz Lab Reports and Test

Course: Applied Physics
Grade Level: 11 PS 3 - The motion of an object is affected by force.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Continuation of Newton's third law as Momentum and Impulse (continued)	Describe Impulse the distance over an interval of time and that impulse equals the change momentum			
	Describe how decreasing or increasing momentum over time has different consequences.	Lab analyze variables affecting path of projectiles	Objects of different mass	Repport
	Explain how net momentum changes after a collision . Continue collision with more complicated collisions (multiple, and different angles) .	Pool ball demonstration	Flat table, balls of different materials	Report

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Rotational Motion	Explain the difference between linear and rotational speed (angular speed) as rotation per unit of time with unit like revolutions per minute Discuss tangential speed that depends on radial distance. Define Rotational Inertia as an object rotating about an axis will continue to do so until acted upon by an external force. Explain torque as lever arm times a force and that all objects have a center of mass and gravity. Show how the location of the CG effects stability. Explain angular momentum.	Lifting chair with feet against wall. Sitting in swivel chair hold rotating wheel Lift heavy object with lever arm	Swivel chair, bicycle wheel Outside, large rock, crowbar	Homework, quiz and test as well as lab write up. Report

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Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
Gravity	Discuss the law of universal gravitation and Newton's theory. Define the inverse square law and detail it's concepts. Describe weightlessness -use moving elevator as example Gravitational pull and tides and Einstein's theory of gravitation	Spray water on paper to discuss the inverse square law.	Spray bottle, paper with grid pattern	Homework, quiz and test as well as lab write up. Report on Einstein's and Newton's theories,

Course: Applied Physics

Grade Level: 11 PS4 - The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
DESIGN TECHNOLOGY	Recognize the basic principles of energy, work and power are related to design technology.	Report on a "Green Building"	Internet	Report / Quiz
TOOLS	Identify tools, such as thermostats and thermal sensors, and explain their use in environmental control systems.	Sample thermostats etc	Thermostat	Homework, Quiz Reports Explain how each works and Test
SOCIAL ISSUES (LOCAL & GLOBAL) ENERGY, POWER, AND TRANSPORTATION	Explain that power systems have a source of energy, a process, loads, and some have a feedback system.	Posters/report on different energy sources,	Poster board, markers	Quiz, Report

Course: Applied Physics
Grade Level: 11 PS4 - The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
ENERGY, POWER, AND TRANSPORTATION (continued)	Demonstrate and explain how an engine converts chemical energy in the form of fuel, into mechanical energy in the form of motion. Calculate the efficiency of an engine, and explain why a perfectly efficient engine is impossible. Explain the relationship between energy and power.	Poster on operation of power plant	Internet, poster board, markers	Poster, report
MANUFACTURING	Explain the benefits of standardization of parts.	Research Ford Co.		Report

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Grade Level: 11 PS4 - The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

Content	Knowledge & Skills	Activities	Resources & Materials	Assessments
CAREER TECHNICAL EDUCATION CONNECTIONS	Explain the kinds of applications of knowledge and skills necessary for jobs/careers specific to the physical sciences.	Repots on various careers	Internet, Interviews	Report