**New Paltz Central School District**
**Physics**

| | ESSENTIAL QUESTIONS/CONTENT | SKILLS | ASSESSMENTS |
|---|---|---|---|
| **September** | **UNIT 1: MATHEMATICAL SKILLS AND MEASUREMENT CONCEPTS**<br>• How are precision and accuracy different?<br>• What is the proper use of measuring tools?<br>• What are the benefits of the metric system?<br>• How are scalar and vector quantities represented and mathematically manipulated? | • Compare English and metric units of measure.<br>• Learn to use measuring devices with precision.<br>• Properly use significant figures mathematically.<br>• Use vectors to represent addition of perpendicular displacement, force, and velocity. | • Quizzes<br>• Tests<br>• Labs |
| **October** | **UNIT 2: MECHANICS – KINEMATICS (LINEAR)**<br>• How is motion represented graphically?<br>• How are velocity, acceleration, and distance calculated?<br>• How are horizontal and vertical motions different? | • Draw graphs of motion.<br>• Interpret graphs of motion using concepts of scope and area.<br>• Use significant figures, units, and precise measurements to analyze motion.<br>• Calculate velocity, acceleration, and distance in linear motion vertically and horizontally. | • Quizzes<br>• Tests<br>• Labs |
| **November** | **UNIT 3: MECHANICS: KINEMATICS (TWO-DIMENSIONAL)**<br>• What factors affect variables of projectiles?<br>• How are height and range of projectiles calculated?<br>• How are horizontal and vertical components analyzed? | • Calculate time of flight for projectiles.<br>• Use time of flight to determine range and height of projectiles.<br>• Observe and demonstrate independency of horizontal and vertical components of projectiles.<br>• Diagram vectors representing projectile motion. | • Quizzes<br>• Tests<br>• Research Lab |

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| **November - December** | **UNIT 4: MECHANICS – DYNAMICS**<br>• What are Newton's Laws of Motion?<br>• What are forces?<br>• What is inertia?<br>• What types of friction exist?<br>• How are various forces calculated? | • Define and exemplify forces acting on an object.<br>• State Newton's Three Laws of Motion.<br>• Identify and calculate static and kinetic friction.<br>• Resolve forces into various components.<br>• Calculate the spring constant of a spring. | • 3-5 page paper<br>• Presentation of findings<br>• Quizzes<br>• Tests<br>• Labs |
| **December - January** | **UNIT 5: ENERGY**<br>• How are potential and kinetic energy related?<br>• How is energy calculated and measured?<br>• How are energy and momentum related and conserved?<br>• How is energy transformed?<br>• How is power related to energy? | • Calculate potential and kinetic energy and power.<br>• Observe and explain energy transformations.<br>• Prove the laws of energy and momentum conservation. | • Quizzes<br>• Tests<br>• Research Lab<br>• Midterm Examination |
| **January - February** | **UNIT 6: ELECTROSTATICS**<br>• How is static electricity different and the same as standard electricity?<br>• How is static electricity created?<br>• How is static electricity measured? | • Draw electric fields for point charges.<br>• Use Coulomb's Law to calculate forces between charges.<br>• Create and observe static charges. | • Quizzes<br>• Tests<br>• Labs |

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| **February – March** | **UNIT 7: ELECTRICITY**<br>• What are electrical fields and what are their uses?<br>• How was the elementary unit of charge determined?<br>• How are electricity and magnetism related?<br>• What is the difference between a series and parallel circuit?<br>• What is current and how is it defined?<br>• What is voltage?<br>• What is resistance and how is it related to current and voltage?<br>• How does a magnetic field affect a current carrying wire or a moving charged particle? | • Draw electric fields for point charges and parallel plates.<br>• Simulate Milikan's oil drop experiment to calculate the charge on one electron.<br>• Draw magnetic field lines for a bar magnet.<br>• Construct and analyze electrical circuits.<br>• Calculate the current in a circuit.<br>• Use Ohm's law to calculate resistance. | • Quizzes<br>• Tests<br>• Research Lab |
| **April - May** | **UNIT 8: MODERN PHYSICS**<br>• What is the particle theory of light?<br>• How is light created?<br>• What is a photon?<br>• How do solar panels operate and produce electricity?<br>• Why do elements have individual atomic spectra?<br>• What do energy level diagrams tell you about elements?<br>• What is the standard model of particles? | • Compare wave theory with particle theory.<br>• Describe light as photons.<br>• Read energy level diagrams.<br>• Use the photoelectric effect to calculate energy and wavelength of photons.<br>• Diagram and describe solar cells.<br>• Determine the energies of the spectral lines of various elements.<br>• Calculate the energy of a photon absorbed or released by an atom.<br>• Discover the building blocks of matter (quarks). | • Quizzes<br>• Tests<br>• Research Lab |

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| **10 Week Mini-Course** | **<u>WAVE THEORY</u>**<br>• How are waves created?<br>• How do waves travel?<br>• What different types of waves exist?<br>• What are the parts of a wave?<br>• How are wave parts related?<br>• How do waves interact with other waves and different media?<br>---<br>• Hooke's law<br>• Periodic motion | • Classify waves as transverse or longitudinal.<br>• Diagram and label wave parts.<br>• Calculate wave period, frequency, and length.<br>• Use the law of reflection and Snell's Law to find wave direction after interaction with media.<br>• Observe and draw examples of reflection, refraction, dispersion, and diffraction.<br>• Calculate wavelength of laser light using Young's experiment. | • Quizzes<br>• Tests<br>• Labs |