

<b>DEPARTMENT: SCIENCE</b>	<b>COURSE TITLE: PHYSICS</b> <b>COURSE NUMBER: 244</b>
<b>GRADE(S): 12 (WITH SOME EXCEPTIONS)</b>	<b>PRE-REQUISITES (IF ANY): GEOMETRY AND ALGEBRA II (OR CONCURRENT ENROLLMENT)</b>

<b>UNIT</b>	<b>LENGTH</b>	<b>CONTENT</b>	<b>SKILLS</b>	<b>METHODS OF ASSESSMENT</b>	<b>FRAMEWORK STRAND(S) &amp; STANDARD(S)</b>
Unit 1: Introduction to Physics and Measurement	12 days	<ul style="list-style-type: none"> <li>• Properties of matter and energy</li> <li>• Fundamental and derived units</li> <li>• Metric system and unit conversion</li> <li>• Scientific notation and order of magnitude estimates</li> <li>• Measurement, accuracy, precision , significant digits, calculation of error</li> <li>• Preparation and analysis of graphs</li> <li>• Linear, quadratic and inverse relationships between variables</li> <li>• Problem solving format</li> </ul>	Students will: <ul style="list-style-type: none"> <li>• Demonstrate problem solving abilities.</li> <li>• Demonstrate experimental design.</li> <li>• Practice lab safety.</li> <li>• Understand measurement and data collection and analysis.</li> <li>• Formulate and test hypotheses.</li> <li>• Understand modeling and critical analysis.</li> <li>• Understand unit conversion.</li> <li>• Conduct graphical analysis of experimental data.</li> <li>• Use Excel to construct data tables and graphs.</li> <li>• Work collaboratively.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab work/reports: Analyzing Experimental Data Lab, Pendulum Motion Lab</li> <li>• Formative assessment</li> <li>• Written class work/ homework</li> <li>• Notebook organization and completion</li> <li>• Unit quiz</li> <li>• Unit exam</li> </ul>	Heat and Energy Transfer: 3.1, 3.4 Motion and Forces: 1.5, 1.6, 1.7, 1.12 Waves: 4.2
Unit 2: Kinematics: Analysis of Motion in a Straight Line	12 days	<ul style="list-style-type: none"> <li>• Motion, position and frame of reference</li> <li>• Scalar and vector quantities</li> <li>• Distance, displacement, speed, velocity and acceleration</li> <li>• Distinguishing between instantaneous and average velocity cases</li> <li>• Analysis of constant velocity and constant acceleration cases</li> <li>• Analysis of graphs of position-time, velocity-time and acceleration-time relationships</li> <li>• Application of Newton's Laws</li> </ul>	Students will: <ul style="list-style-type: none"> <li>• Demonstrate problem solving abilities.</li> <li>• Understand measurement and data collection and analysis.</li> <li>• Create and interpret motion graphs and diagrams.</li> <li>• Demonstrate computer skills of data collection, data analysis, and modeling.</li> <li>• Apply concepts to real world phenomena.</li> <li>• Participate in peer discussion and evaluation of preconceptions.</li> <li>• Make inferences.</li> <li>• Work collaboratively.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab work/reports: Measuring with the Sonic Ranger Activity, Computer Analysis of Motion Labs 1 and 2,, Analyzing Curve Shaped Graphs Lab</li> <li>• Formative assessment</li> <li>• Written class work/ homework</li> <li>• Notebook organization and completion</li> <li>• Class discussion</li> <li>• Self-quiz</li> <li>• Unit quiz</li> <li>• Unit exam</li> </ul>	Motion and Forces: 1.1, 1.3, 1.4, 1.5, 1.6, 1.7, 1.10, 1.12
Unit 3: Introduction to Vectors and Kinematic Equations	12 days	<ul style="list-style-type: none"> <li>• Vector notation and representation</li> <li>• Displacement, velocity, acceleration, and force vectors</li> <li>• Vector scale diagrams</li> <li>• Vector addition in one and two dimensions</li> <li>• Dimensional analysis</li> <li>• Net force and Newton's Second Law</li> </ul>	Students will: <ul style="list-style-type: none"> <li>• Use calculator properly.</li> <li>• Participate in peer discussion and evaluation.</li> <li>• Make inferences.</li> <li>• Understand measurement, data collection and analysis.</li> <li>• Apply concepts to real world phenomena.</li> <li>• Work collaboratively.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab work/reports: Orienteering Lab Practical, Town of King's Court Vector Lab</li> <li>• Formative assessment</li> <li>• Written class work/ homework</li> </ul>	Motion and Forces: 1.1, 1.2, 1.3, 1.4, 1.7, 1.8, 1.12

		<p>problems</p> <ul style="list-style-type: none"> <li>Uniform acceleration equations</li> <li>Acceleration due to gravity and falling bodies</li> </ul>	<ul style="list-style-type: none"> <li>Draw and interpret scale diagrams and maps.</li> <li>Identify variables in word problems.</li> <li>Navigate using a compass.</li> <li>Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>Notebook organization and completion</li> <li>Group problem solving</li> <li>Unit exam</li> </ul>	
Unit 4: Vectors, Forces and Relative Motion	10 days	<ul style="list-style-type: none"> <li>Relative motion</li> <li>Addition of vectors by scale diagram</li> <li>Trigonometric solution of vector problems</li> <li>Navigation problems</li> <li>Resolution of vector components</li> <li>Static and dynamic equilibrium</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>Recognize and use frames of reference to solve problems.</li> <li>Participate in peer discussion and evaluation.</li> <li>Work collaboratively.</li> <li>Draw and interpret scale diagrams and maps.</li> <li>Identify variables in word problems.</li> <li>Use vector applications in navigation problems.</li> <li>Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>Lab work/reports: Vector River Lab Simulation, Vector Navigation of Lab</li> <li>Formative assessment</li> <li>Written class work/homework</li> <li>Notebook organization and completion</li> <li>Class discussion</li> <li>Unit exam</li> </ul>	Motion and Forces: 1.1, 1.2, 1.3, 1.7, 1.12
Unit 5: Empirical Forces and Newton's Laws	12 days	<ul style="list-style-type: none"> <li>Fundamental forces</li> <li>Newton's Third Law</li> <li>Normal forces, gravity, friction, tension, and air resistance</li> <li>Hooke's Law</li> <li>Cavendish experiment</li> <li>Net force and Newton's Second Law of Motion</li> <li>Viscosity and fluid flow</li> <li>Newton's First Law: Inertia</li> <li>Free-fall and terminal velocity</li> <li>Empirical Force Laws</li> <li>Free-body diagrams</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>Make inferences from observations</li> <li>Understand measurement, data collection and analysis.</li> <li>Participate in peer discussion and evaluation.</li> <li>Identify forces in common situations.</li> <li>Use a computer for collection and analysis of data.</li> <li>Use a computer for modeling with simulations.</li> <li>Work collaboratively</li> <li>Identify variables in word problems.</li> <li>Use calculator properly.</li> <li>Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>Lab work/reports: Hooke's Law Lab, Friction Lab, Recognizing Common Forces-Lab Group Discussion, Constructing Free-Body Diagrams Lab</li> <li>Formative assessment</li> <li>Written classwork/homework</li> <li>Gravity Interviews</li> <li>Notebook organization and completion</li> <li>Pre-instruction quiz</li> <li>Unit exam</li> </ul>	Motion and Forces: 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12 Electro-Magnetism: 5.1
Unit 6: Projectile Motion and Universal Gravitation	12 days	<ul style="list-style-type: none"> <li>Inertial and gravitational properties of mass</li> <li>Inverse square law</li> <li>Law of universal gravitation</li> <li>Coulomb's Law</li> <li>Gravitational and electrical fields</li> <li>Projectile motion</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>Make inferences from observations.</li> <li>Understand measurement, data collection and analysis.</li> <li>Apply concepts to real world phenomena.</li> <li>Interview to collect data.</li> <li>Understand mathematical modeling.</li> <li>Perform critical analysis of models.</li> <li>Participate in peer discussion and evaluation.</li> <li>Use a computer for modeling with simulations.</li> <li>Work collaboratively.</li> <li>Identify and use proportionality relationships.</li> </ul>	<ul style="list-style-type: none"> <li>Lab work/reports: Inverse Square Law Activity, Analysis of Plane and Flare Video Simulation Activity, Inertia Lab, Virtual Projectiles Computer Simulation</li> <li>Formative assessment</li> <li>Written class work/homework</li> <li>Notebook organization and completion</li> <li>Class discussion</li> </ul>	Motion and Forces: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12 Electro-magnetism: 5.1, 5.2, 5.3

			<ul style="list-style-type: none"> <li>• Use calculator properly.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Quick write</li> <li>• Pre-instruction quiz</li> <li>• Unit exam</li> </ul>	
Unit 7: Circular and Simple Harmonic Motions	12 days	<ul style="list-style-type: none"> <li>• Frequency and period</li> <li>• Uniform and variable circular motion</li> <li>• Centripetal force and acceleration</li> <li>• “Centrifugal force” and inertia</li> <li>• Kepler’s Laws</li> <li>• Satellite motion</li> <li>• Torque and rotational equilibrium</li> <li>• Simple harmonic motion</li> <li>• Resonance</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Make inferences from observations.</li> <li>• Understand measurement, data collection and analysis.</li> <li>• Apply concepts to real world phenomena.</li> <li>• Participate in peer discussion and evaluation.</li> <li>• Use a computer for modeling with simulations.</li> <li>• Understand mathematical modeling.</li> <li>• Identify and use proportionality relationships.</li> <li>• Use a calculator properly.</li> <li>• Work collaboratively.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab work/reports: Circular Motion Lab, Torque Lab</li> <li>• Formative assessment</li> <li>• Written class work/ homework</li> <li>• Notebook organization and completion</li> <li>• Class discussion</li> <li>• Unit exam</li> </ul>	<p>Motion and Forces: 1.1, 1.3, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12</p> <p>Waves: 4.1, 4.2</p>
Unit 8: Energy and Momentum	14 days	<ul style="list-style-type: none"> <li>• Work and power</li> <li>• Potential and kinetic energy</li> <li>• Energy transformations</li> <li>• Energy conservation laws</li> <li>• Impulse and momentum</li> <li>• Conservation of momentum and angular momentum</li> <li>• Rotation of solids</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Make inferences from observations.</li> <li>• Understand measurement, data collection and analysis.</li> <li>• Apply concepts to real world phenomena.</li> <li>• Participate in peer discussion and evaluation.</li> <li>• Use a computer for modeling with simulations.</li> <li>• Understand mathematical modeling.</li> <li>• Understand application of conservation laws.</li> <li>• Identify and use proportionality relationships.</li> <li>• Use a calculator properly.</li> <li>• Work collaboratively.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab work/reports: Impact Crater Lab, Conservation of Energy Target Lab Practical, Horsepower Activity, Analysis of a Bouncing Bug Activity, Collision Analysis Lab, Rotation of Solids Lab</li> <li>• Formative assessment</li> <li>• Written class work/ homework</li> <li>• Notebook organization and completion</li> <li>• Unit exam</li> </ul>	<p>Conservation of Energy and Momentum: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6</p> <p>Heat and Heat Transfer: 3.1</p> <p>Motion and Forces: 1.5, 1.6, 1.7, 1.8, 1.9, 1.12</p>
Unit 9: Waves, Light, and Optics	8 days	<ul style="list-style-type: none"> <li>• Types and characteristics of waves</li> <li>• Reflection, refraction, diffraction</li> <li>• Constructive and destructive interference</li> <li>• Properties of light</li> <li>• Mirrors and lenses</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Make inferences from observations.</li> <li>• Apply concepts to real world phenomena.</li> <li>• Use a computer for modeling with simulations.</li> <li>• Work collaboratively.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab work/reports: Reflection Lab Practical, Refraction Lab Practical</li> <li>• Written class work/ homework</li> <li>• Notebook organization and completion</li> <li>• Unit exam</li> </ul>	<p>Electro magnetic Radiation: 6.1, 6.2, 6.3, 6.4</p> <p>Waves: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9</p>

Unit 10: Introduction to Electromagnetic Phenomena	8 days	<ul style="list-style-type: none"> <li>• Charge and electrostatics</li> <li>• Conductors and insulators</li> <li>• Current, voltage and resistance</li> <li>• Series and parallel circuits</li> <li>• Capacitors</li> </ul>	Students will: <ul style="list-style-type: none"> <li>• Make inferences from observations.</li> <li>• Understand measurement, data collection and analysis.</li> <li>• Apply concepts to real world phenomena.</li> <li>• Work collaboratively.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab work/reports:  CASTLE Lab Series</li> <li>• Lab Practical</li> </ul>	Electro- Magnetism: 5.1, 5.2, 5.3, 5.4, 5.6, 5.7
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