

**5<sup>th</sup> Grade Force and Motion**  
**2017 Science P.L.U.S. Institute**  
 Roper Mountain Science Center  
 Greenville, South Carolina

**Academic Course Description:**

Hands-on, inquiry-based activities emphasizing science process skills will provide the vehicles for studying concepts that correlate to the South Carolina Science Academic Standards for fifth grade Force and Motion unit. Course topics are designed to enhance the elementary school teacher's physical science knowledge base and provide appropriate lessons for the 5th grade science classroom. Activities are aimed at working with forces, and applying force/motion knowledge to real-world situations. Participants receive a significant quantity of science materials for performing the activities in their classrooms.

**Outline of Course Content:**

Standard Header			
	Topics	Activities or Assignments	Correlation to SC Science Academic Standards
Monday	Introduction to PLUS Pre-Test	PLUS guidelines Pre-Test and survey Science Pedagogy and SEPs Formative assessments/probes Engineering activities – adding a narrative (toxic ice)	<b>5.P.1A.1</b> Ask questions used to (1) generate hypotheses for scientific investigations or (2) refine models, explanations, or designs. <b>5.P.1A.2</b> Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.
Tuesday	Balanced and unbalanced forces Relationship between force and motion Graphing motion	Inquiry science practice – balanced forces Working with inertia – balancing quarters, hex nuts and bombing run Ramp – distance challenge Changing friction Static vs. kinetic friction Zip-Line experiment	<b>5.P.5A.1</b> Use mathematical and computational thinking to describe and predict the motion of an object (including position, direction, and speed). <b>5.P.5A.2</b> Develop and use models to explain how the amount or type of force (contact and non-contact) affects the motion of an object. <b>5.P.5A.3</b> Plan and conduct controlled scientific investigations to test the effects of balanced and unbalanced forces on the rate and direction of motion of objects. <b>5.P.5A.4</b> Analyze and interpret data to describe how a change of force, a change in mass, or friction affects the motion of an object. <b>5.P.5A.5</b> Design and test possible devices or solutions that reduce the effects of friction on the motion of an object.
Wednesday	Balanced and unbalanced forces Changing forces and motion Graphing motion	Pendulum experiment Rocket demonstrations (Alka-Seltzer, water, and fire rockets) Building with K'Nex Real-world examples of force/motion – crash tests Measuring motion with Go-Motion probe	<b>5.P.5A.1</b> Use mathematical and computational thinking to describe and predict the motion of an object (including position, direction, and speed). <b>5.P.5A.2</b> Develop and use models to explain how the amount or type of force (contact and non-contact) affects the motion of an object. <b>5.P.5A.3</b> Plan and conduct controlled scientific investigations to test the effects of balanced and unbalanced forces on the rate and direction of motion of objects. <b>5.P.5A.4</b> Analyze and interpret data to describe how a change of force, a change in mass, or friction affects the motion of an object. <b>5.P.5A.5</b> Design and test possible devices or solutions that reduce the effects of friction on the motion of an object.

Thursday	<p>Graphing Motion</p> <p>Crash vehicle design</p> <p>Application of force/motion knowledge</p>	<p>Students moving</p> <p>Graphing the motion of paper planes</p> <p>Large-scale physical science demonstration</p> <p>Building crash-test vehicles using supplied kits</p> <p>Balloon hovercraft</p>	<p><b>5.P.5A.2</b> Develop and use models to explain how the amount or type of force (contact and non-contact) affects the motion of an object.</p> <p><b>5.P.5A.4</b> Analyze and interpret data to describe how a change of force, a change in mass, or friction affects the motion of an object.</p> <p><b>5.P.5A.5</b> Design and test possible devices or solutions that reduce the effects of friction on the motion of an object.</p>
Friday	<p>Review</p> <p>Participant activities</p> <p>Post Assessment</p>	<p>General overview of course material</p> <p>Force and motion review: air poppers</p> <p>Presentations of participant activities</p> <p>Post-test assessment</p>	<p><b>5.P.1A.1</b> Ask questions used to (1) generate hypotheses for scientific investigations or (2) refine models, explanations, or designs.</p> <p><b>5.P.1A.2</b> Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.</p> <p><b>5.P.5A.2</b> Develop and use models to explain how the amount or type of force (contact and non-contact) affects the motion of an object.</p>

Daily Activities:

- Modeling of science and engineering practices
- Peer discussions of activities, resources, and teaching methodology
- Science Reaction Notebooks
- Exploration of web resources
- Review of day's events – questions and clarifications
- Discrepant events/engineering challenges
- Student probes (formative assessments)