

# Furman University

In cooperation with Roper Mountain Science Center  
and Greenville County Schools

EDU \_\_\_\_\_ (to be assigned by Furman)

## Course for Grade 8 2017 Science P.L.U.S. Institute

EDU \_\_\_\_\_: Course (2 hours non-degree graduate credit)

### Instructor: Garrison Hall

Available in classroom one half hour before and after class.

Science P.L.U.S. Institute office phone: (864) 355-8916

Science P.L.U.S. Institute office FAX: (864) 355-8951

Science P.L.U.S. Institute office E-mail: [astjohn@greenville.k12.sc.us](mailto:astjohn@greenville.k12.sc.us)

Garrison Hall Phone # 864-431-9871

**Academic Term and Year:** Summer 2017   **Dates: Course Dates:** July 17-21, 2017

**Location:** Roper Mountain Science Center

**Academic Course Description:** Hands-on, inquiry-based activities emphasizing science process skills will provide the vehicles for studying concepts that correlate to the SC Science Academic Standards for eighth grade physical science. Major themes throughout the study of force, motion, and waves, are the effects of forces on the motion of objects and the properties and behaviors of waves. Course topics provide additional content to help develop a secure knowledge base for middle school physical science teachers. Principles of force and motion are studied through activities that utilize rubber band powered cars, catapults, and rockets. Special emphasis is placed on measuring and graphing data. Participants receive materials and supplies for performing the activities in their classrooms.

### Course Goals/Objectives:

- Use measurement and time-distance graphs to represent the motion of an object.
- Use the formula for average speed to solve real world problems.
- Analyze the effects of force on the speed and direction of an object.
- Predict how varying the amount of force or mass will affect the motion of an object.
- Analyze the effect of balanced and unbalanced forces on an objects motion.
- Summarize and illustrate the concept of inertia.
- Identify the basic properties of a wave.
- Summarize how energy is transmitted through waves.
- Illustrate how the transfer medium affects the speed of a wave.
- Summarize characteristics of a wave.
- Recognize that an object can only be seen when light from the object enters the eye.
- Explain how absorption and reflection of light waves result in the perception of color.
- Compare the wavelength and energy of waves in various parts of the electromagnetic spectrum.
- Develop a physical science unit correlated with the appropriate South Carolina Science Academic Standards that will utilize the activities, materials, displays, and projects obtained through the Science P.L.U.S. Institute.

**Prerequisites:** No course prerequisites; participants must teach science in a South Carolina public school, grade 8 (or equivalent instructions level special education).

**Resources Required:** None. All materials will be furnished by the Science P.L.U.S. Institute.

**Related Sources Used for Supplementary Reading:** All supplementary materials will be furnished by the Institute.

**Attendance Policy and Assignments:**

The Science P.L.U.S. Institute is an intensive, week-long, hands-on class for South Carolina science teachers. Each of the six different course offerings for the summer of 2017 is based on the appropriate South Carolina Science Academic Standards, a specific school grade, ranging from three through eight. Participants are expected to attend all class sessions, participate fully in class activities, and complete all assignments or assessments. Emergency exceptions will be handled on an individual basis.

**Evaluation Procedures and Standards:**

**GRADING SCALE:**

90-100	A
80-89	B
70-79	C
60-69	D
59 OR BELOW	F

**List Requirements to Determine Grade**

1. Attendance at all sessions
2. Active class participation
3. Completion of all lab and activity written assignments
4. Daily assessments
5. End-of-session assessment

*Any student with a documented disability needing academic accommodations should contact the Science P.L.U.S. Office at 864-355-8916 prior to arriving at the institute. All discussions will remain confidential.*

**Outline of Course Content:**

**What standards are you covering?**

	Topics	Activities or Assignments	Correlation to SC Science Standards
Day 1	<p><b>Matter and Energy</b> Developing students' process skills 8.S.1A.1, 8.S.1A.2, 8.S.1A.3</p>	<p><b>Various activities on matter, dry ice and liquid nitrogen demonstrations</b></p> <ul style="list-style-type: none"> <li>Selected Activities from "Learning and Assessing Science Process Skills"</li> <li>Pendulum Activity</li> <li>Construct Stomp Rocket to be used to demonstrate SC Science Academic standards 8-5.1, 8-5.2, 8-5.3, and 8-5.4.</li> <li>Assign individual demo Activity from a Steve Spangler Book</li> <li>Assign Egg Drop STEM Challenge</li> </ul>	<p>8.S.1A.1 Ask questions to (1) generate hypotheses for scientific investigations, (2) refine models, explanations, or designs, or (3) extend the results of investigations or challenge claims.</p> <p>8.S.1A.2 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>8.S.1A.3 Plan and conduct controlled scientific investigations to answer questions, test hypotheses, and develop explanations: (1) formulate scientific questions and testable hypotheses, (2) identify materials, procedures, and variables, (3) select and use appropriate tools or instruments to collect qualitative and quantitative data, and (4) record and represent data in an appropriate form. Use appropriate safety procedures.</p>
Day 2	<p>Understanding the effects of forces on the motion of objects as they apply to SC Science Academic Standards: 8.S.1B1, 8.P.2A.1, 8.P.2A.2, 8.P.2A.3, 8.P.2A.6, 8.P.2A.7</p>	<ul style="list-style-type: none"> <li>Construct and use a rubber band powered car to create a time-distance graph, calculate average speed, analyze the effects of forces on the speed and direction of the car, and vary the mass to see how it affects the motion of the car.</li> <li>Construct and use a marshmallow catapult to address SC Science Academic standards 8-5.3 and 8-5.4</li> <li>Selected Activities from TOPS Motion Guide</li> </ul>	<p>8.S.1B.1 Construct devices or design solutions using scientific knowledge to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the device or solutions, (3) generate and communicate ideas for possible devices or solutions, (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.</p> <p>8.P.2A.1 Plan and conduct controlled scientific investigations to test how varying the amount of force or mass of an object affects the motion (speed and direction), shape, or orientation of an object.</p> <p>8.P.2A.2 Develop and use models to compare and predict the resulting effect of balanced and unbalanced forces on an object's motion in terms of magnitude and direction.</p> <p>8.P.2A.3 Construct explanations for the relationship between the mass of an object and the concept of inertia (Newton's First Law of Motion).</p> <p>8.P.2A.6 Use mathematical and computational thinking to generate graphs that represent the motion of an object's position and speed as a function of time.</p> <p>8.P.2A.7 Use mathematical and computational thinking to describe the relationship between the speed and velocity (including positive and negative expression of direction) of an object in determining average speed (<math>v=d/t</math>).</p>

Day 3	<p>Understanding of the Properties and Behavior of Waves as they apply to SC Academic Standards: 8.P.3A.1, 8.P.3A.2, 8.P.3A.3, 8.P.3A.4, 8.P.3A.5, 8.P.3A.6.</p>	<ul style="list-style-type: none"> <li>• <i>TOPS activities:</i> Sources of Sound, Frequency, Wave Train, Intensity, Pitch, Sound Mediums, Pencil wave <i>TOPS Learning Systems: Sound</i></li> <li>• Electromagnetic Spectrum</li> <li>• <i>TOPS activities:</i> Light as Particles, Reflection, and Light as Waves, Refraction #1, Refraction #2, and Refraction #3. <i>TOPS Learning Systems: Light</i></li> <li>• Color Decoders and Filters. Why do we see the color red?</li> </ul>	<p>8.P.3A.1 Construct explanations of the relationship between matter and energy based on the characteristics of mechanical and light waves.</p> <p>8.P.3A.2 Develop and use models to exemplify the basic properties of waves (including frequency, amplitude, wavelength, and speed).</p> <p>8.P.3A.3 Analyze and interpret data to describe the behavior of waves (including refraction, reflection, transmission, and absorption) as they interact with various materials.</p> <p>8.P.3A.4 Analyze and interpret data to describe the behavior of mechanical waves as they intersect.</p> <p>8.P.3A.5 Construct explanations for how humans see color as a result of the transmission, absorption, and reflection of light waves by various materials.</p> <p>8.P.3A.6 Obtain and communicate information about how various instruments are used to extend human senses by transmitting and detecting waves (such as radio, television, cell phones, and wireless computer networks) to exemplify how technological advancements and designs meet human needs.</p>
Day 4	<p>Understanding the effects of forces on the motion of objects as they apply to SC Science Academic Standards: 8.P.2A.1, 8.P.2A.2, 8.P.2A.3, 8.P.2A.4, 8.P.2A.5, 8.P.2A.6, 8.P.2A.7</p>	<ul style="list-style-type: none"> <li>• On the Moon Engineering Challenge</li> <li>• Rover</li> <li>• Heavy Lifting</li> <li>• Zip Line</li> <li>• Egg Drop Challenge</li> <li>• History and Construction of real rockets</li> </ul>	<p>8.P.2A.1</p> <p>8.P.2A.4 Analyze and interpret data to support claims that for every force exerted on an object there is an equal force exerted in the opposite direction (Newton's Third Law of Motion).</p> <p>8.P.2A.5 Analyze and interpret data to describe and predict the effects of forces (including gravitational and friction) on the speed and direction of an object.</p>
Day 5	<p>Physical Science in Grade 8 (Teacher Presentations)</p>	<ul style="list-style-type: none"> <li>• Rocket Launch</li> <li>• Great Web Sites and Apps</li> <li>• Teacher Share-a-thon (Lesson Plans)</li> <li>• Final Assessment</li> </ul>	<p>Recap all standards used throughout the week.</p>

Put your web outlines day by day schedule here.