**2017.18 Physics, Ongoing Expectations**

**Big Ideas/Key Concepts:**
- Understandings about scientific inquiry and the ability to conduct inquiry are essential for living in the 21st century.
- Society benefits when engineers apply scientific discoveries to design materials and processes that develop into enabling technologies.
- Science applies mathematics to investigate questions, solve problems, and communicate findings.

**Ongoing Expectations**
*Note: Do not teach a separate unit at year’s beginning. Embed inquiry, tech/engineering, and math throughout all 4 quarters within content where appropriate.*

**Honors Addendum**
*Note for Teachers of Honors: Do not teach this Honors Addendum at the end of the quarter. Embed the Honors Addendum within the regular Scope & Sequence (see end of quarter).*

**Embedded Inquiry**
- **SPI 3221.Inq.1** Select a description or scenario that reevaluates and/or extends a scientific finding.
- **SPI 3231.Inq.2** Analyze the components of a properly designed scientific investigation.
- **SPI 3231.Inq.3** Determine appropriate tools to gather precise and accurate data.
- **SPI 3231.Inq.4** Evaluate the accuracy and precision of data.
- **SPI 3231.Inq.5** Defend a conclusion based on scientific evidence.
- **SPI 3231.Inq.6** Determine why a conclusion is free of bias.
- **SPI 3231.Inq.7** Compare conclusions that offer different, but acceptable explanations for the same set of experimental data.
**Embedded Technology & Engineering**

**SPI 3231.T/E.1** Distinguish among tools and procedures best suited to conduct a specified scientific inquiry.

**SPI 3231.T/E.2** Evaluate a protocol to determine the degree to which an engineering design process was successfully applied.

**SPI 3231.T/E.3** Evaluate the overall benefit to cost ratio of a new technology.

**SPI 3231.T/E.4** Use design principles to determine if a new technology will improve the quality of life for an intended audience.

**Embedded Mathematics**

**SPI 3231.Math.1** Graph basic physics relations and functions.

**SPI 3231.Math.3** Given a graph of a physics relationship, recognize the type of function that relates to that graph: i.e. \( y = x^2 \).

**SPI 3231.Math.2** Determine the slope of a linear function that represents physics data.

**SPI 3231.Math.4** Utilize a graphing calculator to enter physics data and find basic statistics: frequency, range, mean, mode, median, and standard deviation.

**SPI 3231.Math.5** Solve for the \( t \)-value, \( p \) (probability), and \% of confidence between two lists of physics data (manipulated variables and responding variables).

**SPI 3231.Math.6** Reject or accept a null hypothesis based on statistical analysis.

**SPI 3231.Math.7** Find the regression line (equation) between physics data for manipulated and responding variables.

**Special Notation:** Students should know metric conversions.
## 2017.18 Physics, Quarter 1

### Big Ideas/Key Concepts:
- Laws of mechanics are the foundations of classical physics.

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<tr>
<th>Standards</th>
<th>Student Friendly “I Can” Statements</th>
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| **Mechanics**
SPI.3231.1.2 Given various examples of quantities, categorize them as scalar or vector quantities. | **Mechanics**
I can categorize quantities as a scalar or vector quantity. |
| SPI.3231.1.4 Solve motion and conceptual problems regarding velocity, acceleration, and displacement using displacement-time graphs and velocity-time graphs. | I can add or subtract vectors graphically and by components. |
| **Special Notation:** CLE 3231.1.4 “Investigate Kinematics” does not have a matching SPI. | I can interpret a displacement vs. time graph. |
| SPI.3231.1.11 Given a projectile launched at an angle, select the correct equation from a list for calculating: the maximum height of travel, time of flight and/or the maximum horizontal distance covered. | I can interpret a velocity vs. time graph. |
| SPI.3231.1.12 Given a scenario where a projectile is being launched at an angle, answer the following conceptual questions:
- What is the velocity in the y direction when the projectile is at maximum height? | I can calculate displacement given initial and final position. |
| | I can calculate average velocity given displacement and time. |
| | I can solve for the final velocity of an object given initial velocity, uniform acceleration, and either time or displacement. |
| | I can calculate displacement given initial velocity, time, and uniform acceleration. |
| | I can use kinematic equations to solve for freely falling objects in one dimension. |
| | I can solve for the initial velocity, range, time in air, or height of a horizontally launched object when given the other values. |
• What acceleration does the projectile have in the x direction after launch?
• What forces are acting on the projectile in the y direction before it reaches maximum height?

PHY.WCE.1: Explain how air resistance affects the motion of an object in free fall or during projectile motion.

I can identify the acceleration in the x and y directions during projectile motion given a two dimensional launch.
I can identify the velocity in the y direction at maximum height during projectile motion given a two dimensional launch.
I can collect data about a launched projectile and predict the location of the landing of the projectile.
I can explain how the distance traveled or final velocity of a dropped or launched object would change in the presence of air resistance.

Honors Course Addendum
Note for Teachers of Honors: Do not teach this Honors Addendum at the end of the quarter. Embed the Honors Addendum within the regular Scope & Sequence.

Mechanics
SPI 3231.1.4 Investigate kinematics and dynamics.

Mechanics
I can investigate and calculate the range of a two-dimensionally launched object given its angle with the horizontal and its initial overall velocity.
I can investigate and calculate the time it takes for a projectile to be located at a given height in projectile motion, both ascending and descending.
I can investigate and calculate the resultant vector for two or more given vectors at non-perpendicular angles to each other.