Content: Physical Science	**Grade or Course:** AP Physics C: Mechanics	**Date Developed:** 7/7/2018

Overview:

The intent of AP Physics C: Mechanics is to provide an in-depth examination of Newtonian mechanics and energy, focusing both on problem solving and laboratory experiences. A primary goal is to demonstrate to students the relevance of physics through the use of real-life examples that are relevant to my students' lives. In addition, development and appreciation of inquiry and critical thinking skills is stressed; students are regularly asked to apply fundamental physics principles, in conjunction with general problem solving skills, to a wide variety of "real-life" situations.

As this 1.5 credit elective course requires a working knowledge of basic calculus skills (differentiation and integration), students are required to have passed or to be concurrently completing an AP course in calculus (no exceptions will be made to this prerequisite). Most students have a strong interest in pursuing a post-secondary education in the fields of science, engineering, or medicine. The syllabus for this course is based on the syllabus recommended by the College Board.

Essential Questions:

How can scientific models be used to describe and quantify the nature and interactions of matter and energy?

How can simple mathematical models be used to describe physical phenomena? How can more advanced, calculus-based mathematical models improve those descriptions?

How can we use the past and present conditions of the physical world to predict the future?

How accurately can we predict the condition of the physical world based on past and present conditions?

How are physics principles relevant to everyday life?

EO's addressed to proficiency level:

Students will understand, demonstrate, and be evaluated on the following Scientific Practices:

- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Using Math and Computational Thinking
- Obtaining, Evaluating, and Communicating Information

Standards:

Students will understand and use the following additional Scientific Practices:

- Developing and Using Models
- Constructing Explanations and Designing Solutions
- Engaging in Argument over Evidence

Students will understand and use the following Cross-Cutting Concepts:

- Patterns
- Cause and effect: Mechanism and explanation
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter
- Stability and change

Students will understand, use, and be evaluated on the following Disciplinary Core Ideas:

- Students will understand that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. (*HS-PS2-1)*)
- Students will understand that the total momentum of a system of objects is conserved when there is no net force on the system. (*HS-PS2-2*)
- Students will design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. (HS-PS2-3)
- Students will understand how Newton's Law of Gravitation and Coulomb's Law can be used to describe and predict the gravitational and electrostatic forces between objects. (*HS-PS2-4*)
- Students will understand and be able to predict the motion of orbiting objects in the solar system. (HS-ESS1-4)
- Students will understand the relationship between the change in the energy of one component in a system and the change in energy of the other component(s) and the energy flows in and out of the system are known. (*HS-PS3-1*)
- Students will understand that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). (*HS-PS3-2*)
- Students will design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (*HS-PS3-3*)

Units:

Unit 1	**Introduction to Laboratories**
Unit 2	**Kinematics**
Unit 3	**Newton's Laws of Motion**
Unit 4	**Uniform Circular Motion**
Unit 5	**Gravitation**
Unit 6	**Systems of Particles and Linear Momentum**

Unit 7	**Work, Energy, and Power**
Unit 8	**Angular Kinematics and Dynamics**
Unit 9	**Oscillations**

EO Assessments:

- Engineering a Safer Intersection Project
- Atwood's Machine Lab
- Dissipated Energy Lab
- Prosthetics Engineering Project