High School Course Description for **AP Physics 1 SCI461**

Course Title: AP Physics 1

Course Number: SCI461

Grade Level: 11-12

Curricular Area: Science

Length: One year

Prerequisites: Algebra I, Geometry, and one year of UC approved science: Recommend concurrent enrollment in Algebra II or higher.

Meets a UC a-g Requirement: Pending UC Approval

Meets NCAA Requirement:: Pending

Meets High School Graduation Requirement for: Science

Course Description

AP Physics 1 is a college level course that uses advanced algebra and trigonometry as the primary tools for problem solving. It is recommended but not required that the students take AP Physics 1 and then AP Physics 2 in succession. Successful completion (A or B) of Algebra II and Pre Cal (Or current enrollment) is required. The course covers topics in mechanics, energy, waves, thermodynamics, electricity, magnetism, optics, quantum theory, and nuclear physics. Students are expected to devote considerable time and effort to this course, typically 1 to 2 hours per day outside of class. Every student is strongly encouraged to take the AP Physics Exam.

Alignment

This course is aligned to the Next Generation Science Standards.

Instructional Materials

Required Textbook(s)

1. Giancoli, D. (2002). Physics: Principles with Applications, 5th ed. Upper Saddle River, NUJ: Prentice-Hall. ISBN 0-13-061143-3

Supplemental Materials

2. Sears, F., Zemansky, M., & Young, H. (1991). College Physics, 7th ed. Boston, MA: Addison-Wesley. ISBN 0-201-17285-2
3. Sandler, B., Bouadana, D. (1991). Study Guide College Physics, 7th ed. Boston, MA: Addison-Wesley. ISBN 0-201-51246-7

Exit Criteria

Activities	Percentage
Tests and Quizes	50%
Labs and Projects	25%
Homework, Classwork, and Participation	25%

Total: 100%

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Instructional Guide for **AP Physics 1**

OVERVIEW

AP Physics 1: Algebra-based and AP Physics 2 are equivalent of the first and second semesters of introductory, algebra-based college courses. Because these courses are intended to be yearlong courses, teachers have time to foster deeper conceptual understanding through student-centered, inquiry-based instruction. Students have time to master foundational physics principles while engaging in science practices To earn credit or placement. This course requires that 25 percent of the instructional time will be spent in hands-on laboratory work, with an emphasis on inquiry-based investigations that provide students with opportunities to apply the science practices.

BIG IDEAS/ ESSENTIAL UNDERSTANDING	
• *Objects and systems have properties such as mass and charge. Systems may have internal structure.* • *Fields existing in space can be used to explain interactions.* • *The interactions of an object with other objects can be described by forces.*	• *Interactions between systems can result in changes in those systems.* • *Changes that occur as a result of interactions are constrained by conservation laws.* • *Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.*
CONCEPTS (Students will know)	**SKILLS (Students will be able to do)**

- Newton's Laws are not exact but they provide very good approximations unless an object is moving close to the speed of light or is small enough that the quantum effects are important.
- How to solve two-dimensional trajectory problems.
- How to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.
- How to solve two-dimensional problems involving balanced forces (statics).
- How to solve problems in circular motion, using the formula for centripetal acceleration in the following form: a=v2/r.
- How to solve problems involving the forces between two electric charges at a distance (Coulomb's Law) or the forces between two masses at a distance (Universal gravitation).
- How to solve problems involving conservation of energy in simple systems with various sources of potential energy, such as capacitors and springs.
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- Electric and magnetic fields contain energy and act as vector force fields.
- Force on a charged particle in an electric field is qE, where E is the electric field at the position of the particle and q is the charge of the particle.

Unit Guide

1. **Kinematics (Big Idea 3) [CR2a]**
   a. Vectors/Scalars
   b. One Dimensional Motion (including graphing position, velocity, and acceleration)
   c. Two Dimensional Motion

2. **Dynamics (Big Ideas 1, 2, 3, and 4) [CR2b]**
   a. Newton's Laws of Motion and Forces

3. **Universal Law of Gravitation (Big Ideas 1, 2, 3, and 4) [CR2c]**
   a. Circular Motion

4. **Simple Harmonic Motion (Big Ideas 3 and 5) [CR2d]**
   a. Simple Pendulums
   b. Mass-Spring Oscillators

5. **Momentum (Big Ideas 3, 4, and 5) [CR2e]**
   a. Impulse and Momentum
   b. The Law of Conservation of Momentum

6. **Energy (Big Ideas 3, 4, and 5) [CR2f]**
   a. Work
   b. Energy
   c. Conservation of Energy
   d. Power

7. **Rotation (Big Ideas 3, 4, and 5) [CR2g]**
   a. Rotational Kinematics
   b. Rotational Energy
   c. Torque and Rotational Dynamics
   d. Angular Momentum
   e. Conservation of Angular Momentum

8. **Electrostatics (Big Ideas 1, 3, and 5) [CR2h]**
   a. Electric Charge
   b. The Law of Conservation of Electric Charge
   c. Electrostatic Forces

9. **Circuits (Big Ideas 1 and 5) [CR2i]**
   a. Ohm's Law
   b. Kirchhoff's Laws
   c. Simple DC Circuits

10. **Mechanical Waves and Sound (Big Idea 6) [CR2j]**

Lab Requirements and Topics: Students are required to keep the reports in their notebooks in case the college of their choice requires evidence, artifacts or documentation prior to awarding college credit for physics. **[C6, C7]**

Number and Name of Lab	Topic(s) Covered	Time Requirement/ Due Date
1. Density Lab	Mathematics, Units and Significant Figures	55 min. /Due the next day.
2. Measuring Gravity	Acceleration	55 min. /Due the next day.
3. Golf Ball Lab	Velocity, Acceleration and Gravity	55 min. /Due one week after Lab Day.
4. Don't Shoot the Monkey	Two Dimensional Motion	55 min. /Due the next day.
5. Coefficient of Friction	Newton's Laws	55 min. /Due the next day.
6. Step Power	Power is W/t	55 min. /Due the next day.
7. Momentum Cart	Momentum	55 min. /Due the next day.
8. Satellite Motion	Gravity and Centripetal Force	55 min. /Due one week after Lab Day.
9. Hook's Law	Determining the force constant of springs	55 min. /Due the next day.
10. Energy Everywhere	Straight Line and Circular Kinetic Energy	55 min. /Due the next day.

12. Mr. Van De Graff	Electrostatics	55 min. /Due the next day.
13. Building Circuits	Electricity	110 min/Due two days after Lab day.
14. Fun with Springs	Wave properties and Speeds	55 min. /Due the next day.
20. Alternative Fuel Car Project	Energy, Resources, Enviormental Impact	330 min/Due 3 days after computer research