4/17/2015

El Monte Union High School District

Course Outline

High School District

Title: AP PHYSICS 1 (Mechanics)

Transitional*_____(Eng. Dept. Only)

Sheltered (SDAIE)*____Bilingual*___

AP**__X____Honors**_____

Department: Science

Grade Level (s): 11-12th

Semester_____Year__X___

Year of State Framework Adoption_1998_
Year of Next Generation Standards _2013_
(Common Core)

This course meets graduation requirements:

( ) English
( ) Fine Arts
( ) Foreign Language
( ) Health & Safety
( ) Math
( ) Physical Education
(X) Science
( ) Social Science
( ) Elective

Department/Cluster Approval	Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

*Instructional materials appropriate for English Language Learners are required.

**For AP/Honors course attach a page describing how this course is above and beyond a regular course. Also, explain why this course is the equivalent of a college level class.

1. Prerequisite(s): Students should have completed geometry and be concurrently taking Algebra II or an equivalent course. Although the Physics 1 course includes basic use of trigonometric functions, this understanding can be gained either in the concurrent math course or in the AP Physics 1 course itself.

2. Short description of course which may also be used in the registration manual:
AP Physics 1 is an algebra-based, introductory college-level physics course. Students cultivate their understanding of Physics through inquiry-based investigations as they explore topics such as Newtonian mechanics (including rotational motion); work, energy, and power; mechanical waves and sound; and introductory, simple circuits. In addition to providing students a strong foundation in the fundamentals of physics, this course, will also emphasize measurements, unit analysis, data analysis and computational skills necessary for students to be successful in college. Labs will be emphasized to help develop critical thinking and problems solving skills.

3. Describe how this course integrates the schools ESLRs (Expected School-wide Learning Results):

The following ESLR's will be integrated:

Academic Skills: Students will seek, access, analyze and creatively use information to demonstrate effective communication, computation, critical thinking and technological skills by solving problems for assignments, labs and other assessments aligned to the California Content Standards, the Common Core Next Generation Standards, and the District Course Standards.

Interpersonal Skills: Students will be productive community members by learning to respect diversity, exercise rights, accept responsibility and work cooperatively with others while doing work for the class and while working cooperatively in labs.

Personal Skills: Students will make informed decisions, set goals, take actions and evaluate results while exhibiting honesty, integrity and personal accountability as they complete work for the course.

Career Skills: Students will explore a variety of career options and develop personal attributes and skills that lead to the pursuit of a post-secondary education and/or a productive work life as they complete work for the course, perform labs and do research on computers.

4. Describe the additional efforts/teaching techniques/methodology to be used to meet the needs of English Language Learners:

   a) SIOP (Sheltered Instruction Observation Protocol) strategies will be incorporated into lessons.
   b) SDAIE (Specially Designed Academic Instruction in English) strategies will be incorporated into lessons.
   c) ELL supplementary materials will be incorporated into the lessons.
   d) Glossaries will be used as available.
   e) Visuals/Manipulatives will be used.

5. Describe the interdepartmental articulation process for this course:

When applicable, the science department is willing to work with other departments to coordinate student work on course projects. All students take a Tech Core class for an introduction to computer applications. The individual departments then build computer skills through assigning various projects requiring Word Processing, Spreadsheet and Graphing. The Media Center provides class instruction on computer applications and research when needed. The students will be using English skills and Math/Computational skills as they complete work for the class, which will reinforce instruction in those departments and vice versa.

6. Describe how this course will integrate academic and vocational concepts, possibly through connecting activities. Describe how this course will address work-based learning/school to career concepts:

Students will be exploring career pathways and employment requirements within the Physics.

7. Materials of Instruction (Note: Materials of instruction for English Language Learners are required and should be listed below.)

   A. Textbook(s) and Core Reading(s):
   Physics: Principles with Applications 6th edition Pearson, Prentice Hall 2008

   B. Supplemental Materials and Resources:
   5 Steps to A 5: AP Physics 1 Algebra Based

   C. Tools, Equipment, Technology, Manipulatives, Audio-Visual:

Visual presentations will be made using overhead transparencies, videos, models and/or presentations with a LCD projector. A variety of standard glassware, physics equipment and laboratory equipment including balances, hotplates, stopwatches, masses, pulleys , etc. will be used during the laboratories. Standard computer technologies including MS Office, web browsers and 3rd party software will be used as necessary.

8.

- **Objectives of Course**
- **Unit detail including projects and activities including duration of units (pacing plan)**
- **Indicate references to state framework(s)/standards (If state standard is not applicable then national standard should be used)**
- **Student performance standards**
- **Evaluation/assessment/rubrics**
- **Include minimal attainment for student to pass course**

Course Objectives:

1) Students will learn concepts and applications in mechanical Physics, as prescribed by the California Science Content Standards and the Science & Engineering Common Core Next Generation Standards and the AP College Board.
2) Students will learn advanced laboratory skills and measurement skills necessary to be successful college science courses.
3) Students will learn computational skills and how to apply basic concepts of algebra, geometry and basic trigonometry to solve advanced equations physics, specifically those in mechanics.
4) Students will learn how to engage in inquiry based labs/investigations and then write college level lab reports.
5.) Students will learn the appropriate material to be successful on the AP exam in AP Physics 1.

Laboratory Investigation and Experimentation:

All students are expected to have an understanding of common laboratory safety procedures as demonstrated by their use during practical laboratory activities. 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.

The following are some suggested labs, to be supplemented, by additional labs preferred by the instructor.

Unit	Labs/Projects
Units, measurement, scaling	Accuracy and Uncertainty in Measurement
Kinematics, lab skills	Measuring the Speed of Sound
Lab skills	The Simple Pendulum
1D Kinematics	Investigating Motion with a Motion Detector
	Finding Acceleration by the Finite Difference Method
	Acceleration of a Falling Object
2D Kinematics	Dropped and Projected Marbles
	Range of a Projectile
	The Bouncing Ball: A Challenge Lab
Newton's Laws	Newton's 2nd Law
	Equilibrium of Forces: A Challenge Lab
	Acceleration in a Long Fall
Application: Static Friction	Static and Kinetic Friction
Application: Hooke's Law	Hooke's Law
Application: Circular motion	Turntable Physics
Application: Circular motion	Acceleration of a Swing

Work and kinetic energy	Work on an Inclined Plane
Conservation of energy	Energy Curves for a Pendulum.
	Using a Pendulum and Conservation of Energy to Measure *g*
Impulse and momentum	Average Force of Impact in a Rebounding Collision
Conservation of momentum	Conservation of Momentum and Kinetic Energy in Collisions
Conservation of energy and momentum	The Ballistic Pendulum
Center of mass	Conservation of Momentum and Kinetic Energy in a Two-dimensional Collision
Rotational motion	Center-of-mass Motion of a Projectile
Rotational dynamics	Period of a Physical Pendulum
Gravitation/satellite motion	Orbits of Satellites
Simple harmonic motion	Simple Harmonic Motion
Doppler effect	The Doppler Effect
Mechanical waves	Speed of Waves on a Helical Spring
Mechanical waves	Standing Waves on a String
Sound	Harmonics and Sound Quality

Resonance in pipes	Standing Waves in Pipes
Electrostatics	Investigations in Electrostatics
Electrostatics	Investigations in Electrostatics: Challenge Problems
Electric force	Coulomb's Law Challenge Problem
Electric circuits	Characteristics of a Light Bulb
Electric circuits	Current, Potential Difference, and Resistance in Single Loop Circuits
Electric circuits	Series and Parallel Circuits
Electric circuits	Combination Circuits

Student Performance Standards for AP Physics 1 (Mechanics)

The content for the course is based on six big ideas:
Big Idea 1 – Objects and systems have properties such as mass and charge. Systems may have internal structure.
Big Idea 2 – Fields existing in space can be used to explain interactions.
Big Idea 3 – The interactions of an object with other objects can be described by forces.
Big Idea 4 – Interactions between systems can result in changes in those systems.
Big Idea 5 – Changes that occur as a result of interactions are constrained by conservation laws.
Big Idea 6 – 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.

Kinematics (Big Idea 3): (The students will be able to …)
CCSS: none

a) Identify the difference between Vectors/Scalars
b) Calculate various equations and understand all the concepts related to One Dimensional Motion (including graphing position, velocity, and acceleration)
c) Calculate various equations and understand all the concepts related to Two Dimensional Motion

Dynamics (Big Ideas 1, 2, 3, and 4): (The students will be able to …)
CCSS: HS-PS2-1,2

a) Calculate various equations and understand all the concepts related to Newton's Laws of Motion and Forces

Universal Law of Gravitation (Big Ideas 1, 2, 3, and 4): (The students will be able to …)
CCSS: HS-PS3-1,2

a) Calculate various equations and understand all the concepts related to Circular Motion

Simple Harmonic Motion (Big Ideas 3 and 5): (The students will be able to …)
CCSS: HS-PS3-2,4, HS-PS-1-3

a) Calculate various equations and understand all the concepts related to Simple Pendulums
b) Calculate various equations and understand all the concepts related to Mass-Spring Oscillators

Momentum (Big Ideas 3, 4, and 5): (The students will be able to …)
CCSS: HS-PS4-1,3,5

a) Calculate various equations and understand all the concepts related to Impulse and Momentum
b) Calculate various equations and understand all the concepts related to The Law of Conservation of Momentum

Energy (Big Ideas 3, 4, and 5): (The students will be able to …)
CCSS: HS-PS2-5,6, HS-PS3-1,2,5

a) Calculate various equations and understand all the concepts related to Work
b) Calculate various equations and understand all the concepts related to Energy
c) Calculate various equations and understand all the concepts related to Conservation of Energy
d) Calculate various equations and understand all the concepts related to Power

Rotation (Big Ideas 3, 4, and 5): (The students will be able to …)
CCSS: HS-PS1-8, HS-ESS1-1,2,3,6

a) Calculate various equations and understand all the concepts related to Rotational Kinematics
b) Calculate various equations and understand all the concepts related to Rotational Energy
c) Calculate various equations and understand all the concepts related to Torque and Rotational Dynamics
d) Calculate various equations and understand all the concepts related to Angular Momentum
e) Calculate various equations and understand all the concepts related to Conservation of Angular Momentum

Electrostatics (Big Ideas 1, 3, and 5): (The students will be able to …)
CCSS: HS-ESS1-5, HS-ESS2-1,3

a) Calculate various equations and understand all the concepts related to Electric Charge
b) Calculate various equations and understand all the concepts related to The Law of Conservation of Electric Charge
c) Calculate various equations and understand all the concepts related to Electrostatic Forces

Circuits (Big Ideas 1 and 5): (The students will be able to …)
CCSS: HS-ESS2-2,6, HS-ESS3-1

a) Calculate various equations and understand all the concepts related to Ohm's Law
b) Calculate various equations and understand all the concepts related to Kirchhoff's Laws

c) Calculate various equations and understand all the concepts related to Simple DC Circuits

Evaluation/ Assessment/ Rubrics including Attainment for Student to Pass AP Physics 1

"A"-level work (90-100%): (Excellence overall; no major weaknesses).
This student demonstrates real achievement in grasping scientific thinking, along with development of specific physical science thinking skills and abilities. This student's work is clear, precise, and well reasoned.

"B"-level work (80-89%): (Moderate level of understanding and skill in scientific thinking with some distinctive weaknesses, showing more strengths than weaknesses).
This student demonstrates a good level of achieving scientific thinking with occasional areas of weakness. This student's work is essentially clear and precise with occasional lapses into weak reasoning.

"C"-level work (70-79%): (More than a minimum level of understanding and skill in scientific thinking, but highly inconsistent with as many weaknesses as strengths.)
This student demonstrates a mediocre level of achieving scientific thought with pronounced areas of weakness. This student's work is inconsistent, showing only modest skills and reasoning.

"D"-level work (60-69%): (Minimal level of understanding and skill in scientific thinking).
This student demonstrates a lack of clarity and discipline. This student's work does not show good scientific reasoning and skills, only rarely showing any attempt to take charge of ideas.

"F"=level work (<59%): (Far below minimal level of understanding and skill in scientific thinking).
This student does not display any discernible scientific reasoning. This student failed to do the required work of the course.