SAN LEANDRO UNIFIED SCHOOL DISTRICT

SECTION A. COURSE DESCRIPTION COVER PAGE

1. Course Title: Advanced Placement Physics B	6. Prerequisites Algebra II
2. Action: __X_ New Course ___ Course Revision ___ Title Change Only	7. Grade Level: 10-12
3. Transcript Title/Abbreviation: AP Physics	8. Elective/Required: elective
4. Transcript Course Code/Course Number:	9. Subject Area: Physical Science
5. CBEDS Code:	10. Department: Science
11. Length /Credits: ___ 0.5 (half year or semester equivalent) __X_ 1.0 (one year equivalent) ___ 2.0 (two year equivalent)	
12. Was this course previously approved by UC? ___ Yes __X_ No If so, year removed from list: _____	
13. Meets the "__d__" requirements in the a-g university/college entrance requirement. Approval date: _____	
14. School Contact Information Name: Sarah Kayler Title/Position: teacher Phone: 510-618-4600 x 2341 Fax: 510-347-1064 E-Mail:	
15. Signatures: Department Chair: _____ Site Leadership Chair/Site Curriculum Committee Chair: _____ Principal: _____ Other: _____	
16. Date Approved by Board of Education:	

SECTION B. COURSE CONTENT

17. Course Description:

AP Physics B will be a first or second year of physics that students take as a sophomore, junior, or senior. It builds upon the introductory physics concepts that students have learned in 8th grade or by taking the high school conceptual physics class. It is a year long course that teaches the concepts of physics using algebra and trigonometry, rarely calculus. Students need to be enrolled in Pre-Calculus or higher. Problem solving and laboratory skills are emphasized.

18. Course Goals and/or Major Student Outcomes:
    1. A thorough understanding and appreciation of the physical world around them.
    2. A knowledge of mechanics, the laws of motion and Newton's Laws.
    3. A knowledge of electricity and magnetism.
    4. A knowledge of waves, optics, and the nature of light.
    5. A knowledge of modern physics including relativity and nuclear physics.
    6. Students who complete this course should be able to earn a passing grade on the Advanced Placement Exam, Physics B.

19. Course Objectives (standards):

The list below includes some sample objectives from every unit.

1. The student will develop advanced problem solving skills using reasoning, algebra and trigonometry.
2. The student will have the ability to read, collect, and interpret physical data.
3. The student will learn to use models and diagrams to represent the physical world, understanding the limitations and usefulness of those models.
4. Students will perform laboratory work requiring data collection, analysis, assessment of uncertainty, and the drawing of conclusions.
5. Students will become familiar with lab equipment, including computer based sensors and software.
6. Students will be familiar with the metric system of measurement and be able to use dimensional analysis to check the validity of equations.
7. Students will be able to distinguish between and work with vectors and scalars.
8. Students will be able to distinguish between contact forces and field forces.
9. Students will be able to determine the net external force on an object.
10. Students will be able to describe the position, velocity, and acceleration of an object and understand the relationship between those terms.
11. Students will be able to identify action-reaction pairs.
12. Students will be able to define work by relating it to force and displacement.
13. Students will be able to apply Newton's Laws to solving problems.
14. Students will be able to classify and calculate different types of energy.
15. Students will be able to solve problems using conservation of energy or conservation of momentum.
16. Students will be able describe changes in momentum in terms of force and time.

17. Students will be able to distinguish between torque and force and calculate the magnitude of a torque on an object.
18. Students will be able to identify the center of mass of an object.
19. Students will be able to distinguish between mass and moment of inertia.
20. Students will be able to define equilibrium and solve related problems.
21. Students will be able to calculate the angular momentum for various rotating objects.
22. Students will be able classify the states of matter.
23. Students will be able determine the magnitude of the buoyant force exerted on a floating object.
24. Students will be able to calculate how pressure varies with fluid depth.
25. Students will be able to apply Bernoulli's equation to solve fluid flow problems.
26. Students will be able to use the ideal gas law.
27. Students will be able to explain heat as the energy transferred between to objects of different temperatures.
28. Students will be able to relate heat and temperature change on the macroscopic level to particle motion on the submicroscopic level.
29. Students will be able to explain the relationship between heat and work.
30. Students will be able to explain how force, velocity, and acceleration change as an object vibrates with simple harmonic motion.
31. Students will be able to calculate the period and frequency of an object vibrating with simple harmonic motion.
32. Students will be able to use the relationship between wave speed, frequency and wavelength to solve problems.
33. Students will be able to apply the superposition principle.
34. Students will be able to identify the components of the electromagnetic spectrum and describe the nature of light.
35. Students will be able to describe the nature of images produced by flat and curved mirrors and lenses.
36. Students will be able to recognize situations in which refraction, interference, and diffraction will occur.
37. Students will be able to use ray diagrams and the mirror equation to find the position of an image produced by lenses.
38. Students will be able to describe electric charges and fields.
39. Students will be able to calculate electric forces and field strength.
40. Students will be able to describe the properties of electric current.
41. Students will be able calculate resistance, current and potential difference.
42. Students will be able to construct and analyze circuit diagrams.
43. Students will be able to describe the Earth's magnetic field and analyze magnetic fields in general.
44. Students will be able to calculate the induced emf and current using Faraday's Law of Induction.
45. Students will be able to describe the modern model of the atom, incorporating atomic spectra, the photo electric effect, and blackbody radiation.
46. Students will be able to describe the subatomic particles and nuclear stability.

20. Course Outline:

Mechanics - 9 Weeks: Kinematics in One Dimension, Kinematics in Two Dimensions, Forces Newton's Laws, Uniform Circular Motion, Work & Energy, Impulse – Momentum, Simple Harmonic Motion, Fluids

Labs: Graph Matching – A student moves with a motion sensor to match pre –made graphs with various position, velocity, and acceleration.

Dynamics Cart/Track – Students use Vernier carts and tracks with photo-gates, pulleys and masses to measure and observe both accelerated and constant motion.

Acceleration due to Gravity – Students use photo-gates and picket fences to measure the acceleration due to gravity.

Force – Student measure and test Newton's Laws using dynamics carts and force probes.

Friction – Using various blocks on an incline, students explore the properties of friction.

Centripetal Force – Students twirl a mass on a string. The string runs through a small tube and supports a mass at the end. Students measure and calculate the radius, angular speed and centripetal force.

Impulse and Momentum – Using dynamics carts on tracks students measure momentum change and impulse.

Pendulums – Students measure various pendulums to determine the relationship between period, length, mass, and amplitude.

Rollercoaster – Students construct a marble track rollercoaster. They use photo gates to measure the final speed of their marble. Using initial height, final speed, conservation of energy, and angular momentum they analyze the system.

Heat - 2 Weeks: Temperature and Heat, Ideal Gas/ Kinetic Theory, Thermodynamics

Labs: Determining Specific Heat of a Metal – Students heat samples of metal then measure the temperature change of water that the metal is added to.

Gas Laws – Students use syringes of air to determine the relationship between pressure, volume, and temperature.

Fluid Dynamics – 2 weeks: Pressure, Buoyancy, Fluid flow, and Bernoulli's equation.

Labs: Archimedes' Principal — Students measure the volume of displaced water, and the weight of the object in air and in water.

Electricity & Magnetism - 6 Weeks: Electric Forces & Fields, Electric Potential, Circuits, Magnetic Forces & Fields, Electromagnetic Induction

Labs: Electrostatics – Students explore charges on pith balls, electroscopes, and use a Van de Graff generator.

Circuits – Students do a series of experiments making and analyzing circuits with various components using voltmeters and ammeters to measure potential and current.

Magnetic Field of a Conducting Wire – Students use magnetic force probes to measure the magnetic field around a wire.

Induction – Students induce a current in a solenoid with a magnet.

Waves - 5 Weeks: Waves, Sound, Electromagnetic Waves, Mirrors, Optics, Interference

Labs: Pulses in a Ripple Tank - Students will observe the behavior of pulses in a ripple tank, determine what relationship exists between the angle of incidence and the angle of reflection (The Law of Reflection), and observe the diffraction and interference of waves.

Refraction - Students measure the angle of incidence and the angle of refraction of light rays on glass and calculate the index of refraction using Snell's Law.

Lenses/Mirrors - Students produce various images of a candle using a variety of lenses and mirrors.

Diffraction of light – Students use diffraction grating to measure the wavelengths of colored light.

Modern Physics - 4 Weeks: Relativity, Particles & Waves, Atomic Physics, Nuclear Physics, Nuclear Energy

Labs: Observation of Spectra – Students observe the emission spectra from several elements.

Review - 3 Weeks

AP Physics Exam - May

Physics Project – final weeks of class

Mousetrap Cars, Catapults, Rockets, Ruth-Goldberg device

21. Instructional Materials:

Required Text(s):
Title: College Physics
Publisher: Serway and Vuille
Edition/Copyright Date: 9th Edition 2012

Supplementary materials (include Title, Publisher, Edition/Copyright Date if appropriate): Verneir Lab Equipment, including dynamics carts, photo-gates, force sensors, motion sensors, ect.

22. Instructional Methods and/or Strategies

This course focuses on the application of mathematics in the field of physical science. Class time consists of lecture, demonstration, lab work, and problem solving 5 hours/week. Students do lab work every week. Students are evaluated by their performance on weekly problem sets, weekly lab reports, bi-weekly quizzes, unit exams, and a semester final exam.

23. Assessment and Evaluation

Students will be assessed on the basis of the following categories:

10%: Problem sets

15%: Laboratory Reports
65%: Tests, Quizzes, and the Final Exam
10%: Project (see examples above)

24. Grading Policy

Analysis of Laboratory Work and in Class Exams will make majority of grade. Homework and Class Participation will also be factored in. The AP Exam will also be considered.

25. Fiscal Impact

a) Price of Textbook - $165 (less 15% publisher's discount)
b) Estimated number of Sections - 2
c) Estimated number of students per section - 30
d) Estimated textbook expenses - $8415
e) Teacher Stipend, if appropriate - $2400
f) Lab Materials - $500
g) Total Estimated Expenditures = $11,315

26. Context for offering the course:

This course will add another opportunity for high school students to get a head start on college-level work, hence broaden their intellectual horizons and stand out in the college admissions process. This course will give them an opportunity to explore the natural world. This is an ideal course for students considering careers in science or engineering.