ion High School District

Course Outline

High School Arroyo High School

Title: AP Physics C Electricity & Magnetism

Transitional*_____(Eng. Dept. Only)

Sheltered (SDAIE)*____Bilingual*___

AP**__X_____Honors**_____

Department:___Science___

Grade Level (s):_____10-12_____

Semester_____X_____Year_____

Year of State Framework Adoption_____

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):
   - Pass the AP Calculus BC exam with a 3 or better or concurrently taking AP Calculus BC.
   - All students will be required to take the AP Physics C Electricity & Magnetism exam in May.

2. Short description of course which may also be used in the registration manual:

This course ordinarily forms the first part of the college sequence that serves as the foundation in physics for students majoring in the physical sciences, engineering, or math. The sequence is parallel to or proceeded by mathematics courses that include calculus. Methods of calculus are used whenever appropriate in formulating physical principles and in applying them to physical problems. The sequence is more intensive and analytic than that in the B course. Strong emphasis is placed on solving a variety of challenging problems, some requiring calculus. The subject matter is principally mechanics, electricity, and magnetism. First semester is devoted to mechanics. Use of calculus in problem solving and in derivations is expected to increase as the course progresses. In the second semester, the primary emphasis is on classical electricity and magnetism. Calculus is used freely in formulating principles and in solving problems. Students will be expected to take the Advanced Placement Physics Exam in May.

ols ESLRs (Expected School-wide Learning Results):

assroom discussions and on classroom projects.
oom and homework assignments.
- Students will conduct lab investigations.

- Critical thinkers:
  - Students will understand the process of goal setting and develop a personal plan for high school and beyond.
  - Students will conduct lab investigations that present problems to solve and use critical thinking skills.
  - Students will apply theoretical and practical knowledge acquired to everyday situations.

- Competent users of technology:
  - Students will use word processing and presentation programs to present their work.
  - Students will use computers for research and development of projects.
  - Students will receive supervised Internet instruction and utilize the net as a tool to assist them in their class work.

- Ethical and respectful individuals:
  - Students will be made aware of ethical behavior and the consequences for unethical behavior (cheating, copying, and plagiarizing).
  - Students will work cooperatively in diverse groups.
  - Students will be expected to assume personal responsibility for their actions and spoken words when working with other students.

- Active community participants:
  - Students will be encouraged to respect diverse cultures within the classroom setting.
  - Students will be given opportunities to participate in school clubs and activities that respect cultural diversity.
  - Student will learn to work cooperatively with each other in groups when doing labs and projects.
  - Students will develop working relationships across gender and cultural groups.

4. Describe the additional efforts/teaching techniques/methodology to be used to meet the needs of English Language Learners:
   - SDAIE (Specially Designed Academic Instruction in English) strategies will be incorporated into lessons
   - Vocabulary development will be emphasize
   - Visuals/manipulatives will be used

5. Describe the interdepartmental articulation process for this course:

When applicable, the science department works with other departments to coordinate student work on course projects. All students take a course to introduce them to computer applications. The individual departments then build computer skills though assigning various projects requiring Power Point presentation, word processing, spreadsheet, and graphing. This course will work hand in hand with AP Calculus AB & BC classes. Projects will be assigned that will correlate with math intensively.

emic and vocational concepts, possibly through connecting
ress work-based learning/school to career concepts:
athways by attending field trips to colleges and corporations, such as JPL, having guest speakers come to inform students about their field, and evaluating current topics by analyzing case studies. A House Building project will consists of a floor plan, building of the house, wiring the house the lights, switches, and batteries, and also a presentation to sell the house to potential buyers. This project will teach students about architecture, planning, cost of materials, electrical planning and wiring, and the cost of building a real home and ways to sell the home.

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):
   Text: Halliday, D., Resnick, R., & Walker, J. (2010). *Fundamentals of physics*. (9th ed.). New Jersey: John Wiley & Sons, Inc.

   B. Supplemental Materials and Resources:
   - Supplementary materials provided by the publisher of the text.
   - Standard supply lab materials, as necessary.

   C. Tools, Equipment, Technology, Manipulative, Audio-Visual:
   Visual presentations will be made using demonstrations, videos, models and/or presentations with an LCD projector. A variety of lab equipment will be utilized, such as lasers, mirrors, lenses, and rollercoaster sets.

lly and analytically)
s
Methodically as a physicist / engineer

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Unit detail including projects and activities including duration of units (pacing plan)

Pacing Plan

2nd Semester

4th 6 weeks

- **Electrostatics**
  Coulombôs Law, Electric Fields & GaussôLaw, Electric Potential energy & Electric Potential, Capacitance, and Applications
- **Electric Circuits**
  Current, Resistance, Power, DC Circuits, and Capacitors

5th 6 weeks

- **Magnetic Fields**
  Forces on Moving Charges, Forces on Current Carrying Wires, and Fields of Long Current Carrying Wires
- **Electromagnetism**
  Magnetostatics, Electromagnetic Induction, and Applications

6th 6 weeks

- Review for both AP Physics C (Mechanics and Electricity & Magnetism)

Indicate references to state framework(s)/standards (If state standard is not applicable then national standard should be used): The College Board Standards are addressed and implemented within the curriculum.

- **Course Outline**

2nd Semester

Days	Course Outline (Ch. In Fundamentals)	Lab Activities
5	**Ch. 21: Electric Charge**	
	Electric Charge	**Electroscope Lab** Determine how to charge objects and induce positive and negative charges
	Conductors and Insulators	
	Coulomb's Law	Phet Simulation: Charges & Fields
	Charge is Quantized	
	Charge is Conserved	
5	**Ch. 22: Electric Fields**	
	Electric Field	
	Electric Field Lines	**Equipotential Lines Lab** Draw equipotential & field lines on conductive paper
	Electric Field due to various Charge Distributions	
7	**Ch. 23: Gauss' Law**	

	Electric Potential Energy	
	Electric Potential	
	Equipotential Surfaces	
	Potential & Point Charges	
	Potential due to various charge distributions	
7	**Ch. 25: Capacitors**	
	Capacitance	**Capacitance Properties Lab** Students determine the relationships between: 1) size of plates and charge capacity; 2) plate separation and charge capacity.
	Calculating Capacitance for various shapes	
	Capacitors in Series & Parallel	
	Dielectrics	
6	**Ch. 26: Current & Resistance**	
	Electric current	
	Resistance & Resistivity	**Resistivity of a Slinky Lab** Will investigate the relationship between the resistance and length of a toy Slinky and use ohmmeter to measure resistance as a function of the number of coils
	Resistors in parallel and series	**Series & Parallel Circuit Lab** Will construct series, parallel, and combination circuits and measure voltage drop, current, & equivalent resistance using a digital multimeter probe
	Ohmôs Law	
	Power	
6	**Ch. 27: Circuits**	
	Work, Energy, & EMF	Phet Simulation: Battery Voltage
	Kirchhoffôs Rules	
	RC Circuits	**Capacitor Lab** Charging and discharging a capacitor in an RC circuit w/AA cell & plot the voltage vs time graph; find how much charge was stored on the capacitor from the charge and discharge curves
6	**Ch. 28: The Magnetic Field**	
	Definition of Magnetic Field	
	Magnetic Forces on Moving Charges & Current	
	Hall Effect	
	Circulating Charge	
6	**Ch. 29: Magnetic Fields due to Current**	
	Magnetic Field due to Current	
	Biot-Savart Law	
	Ampere's Law	
	Solenoids & Toroids	**Solenoid Lab** The measurement of magnetic field inside a solenoid and its variation with current; calculate how many layers of wire are wrapped around the solenoid
8	**Ch. 30: Induction & Inductance**	
	Magnetic Flux	
	Faraday's Law of Induction	**Faraday Pickup Lab** Create an electromagnet that will pick up the most paper clips
	Lenz's Law	

		RL Circuits Lab graph current vs. time
	Energy in Magnetic Fields	**Magnetic Field of the Earth Lab** Students measure the magnitude and inclination angle of the magnetic field of the earth.
6	**Ch. 32: Maxwell Equations**	
	Maxwellôs Equation in Integral Form	
	Implications of Maxwellôs Equations	

- **Evaluation/assessment/rubrics**

ñAò ï level of work (90-100 %)
ñBò ï level work (80-89%)
ñCò ï level work (70-79%)
ñDò ï level work (60-69%)

ñFò ï level work (50-59%)

The grade is weighted using the following percentages:
Tests/Quizzes ï 55%
*Labs, Activities, Projects ï 20%
Homework ï 10%
Final Exam ï 15%

*Approximately one class period per week/chapter will be devoted to laboratory/field experimentation. Labs will provide opportunities for students to solve problems, to form hypotheses, make observations, quantify/record data, interpret and analyze data and results, draw conclusions, think critically and apply what is explored in the course of their daily lives and future careers.