Chino Valley Unified School District
High School Course Description

A. CONTACTS	
1. School/District Information:	School/District: Chino Valley Unified School District Street Address: 5130 Riverside Dr., Chino, CA 91710 Phone: (909) 628 - 1201 Website: chino.k12.ca.us
2. Course Contact:	Teacher Contact: Office of Secondary Curriculum Position/Title: Director of Secondary Curriculum Site: District Office Phone: (909) 628 - 1201 X1630
B. COVER PAGE - COURSE ID	
1. Course Title:	Advanced Placement Physics C: Electricity and Magnetism
2. Transcript Title/Abbreviation:	AP PhysC E & M
3. Transcript Course Code/Number:	5429
4. Seeking Honors Distinction:	Yes
5. Subject Area/Category:	Meets UC/CSU "D" laboratory science requirement
6. Grade Level(s):	11-12
7. Unit Value:	5 credits per semester/10 credits total
8. Course Previously Approved by UC:	Yes
9. Classified as a Career Technical Education Course:	No
10. Modeled after an UC-approved course:	Yes
11. Repeatable for Credit:	No
12. Date of Board Approval:	June 1, 2023
13. Brief Course Description: Advanced Placement Physics C: Electricity and Magnetism (AP Physics C: E&M) is a calculus-based, college-level physics course, designed for students planning to specialize or major in physics or engineering. The course explores topics such as electrostatics; conductors, capacitors, and dielectrics; electric circuits; magnetic fields; and electromagnetism. Introductory differential and integral calculus are used throughout the course.	
14. Prerequisites:	AP Physics 1
15. Context for Course: AP Physics C: E&M expands on concepts taught in AP Physics 1 but is focused on topics of electricity and magnetism. The AP Physics C: E&M course serves as a foundational course in physics for students wanting to major in the physical sciences or engineering and prepares students to take the AP Physics C: E&M exam.	
16. History of Course Development: AP Physics C: E&M further prepares students who are looking to study engineering at the university level.	
17. Textbooks:	Pearson. *AP Physics, 4th Edition.* Walker. 2011
18. Supplemental Instructional Materials:	N/A
C. COURSE CONTENT	
1. Course Purpose: Provide students with the opportunity to: ● Earn credit or placement for qualifying AP Exam grades ● Stand out in the admission process ● Earn academic scholarships and awards from colleges and universities ● Experience a college-level exam ● Be prepared for college-level course work	

2. Course Outline:

Unit 1 – Electrostatics
In this unit, students will begin the study of electric force, which acts on all objects with a property called charge. The electric force, in contrast to gravitational force, is one of attraction or repulsion and therefore leads to different effects on objects. This knowledge will help students understand the role electrostatics has in common devices such as photocopiers, defibrillators, and printers, as well as television, radio, and radar industries. In the units that follow, students will apply their knowledge of electric charges and force to electric circuits, and how the motion of electric charges helps create magnetic fields.

Unit 2 - Conductors, Capacitors, Dielectrics
Students will examine how that charge can move through an object. Conductors, capacitors, and dielectrics are presented to demonstrate that a charge's movement is dependent on an object's material. In electronics, each of these are important based on the type of movement or desired object behavior. Additionally, this unit examines how the behavior of these elements is impacted by electric fields. Students should be provided with opportunities (laboratory investigations or activities) to describe and examine the function of each of these elements, along with capacitors. Knowledge of conductors, capacitors, and dielectrics will prepare students for understanding how electric circuits work in unit 3 and how they behave when one or more electrical element is altered or modified.

Unit 3 - Electric Circuits
Whether or not they're aware, students interact with electric circuits regularly through charging their phones, powering up their laptops, or simply switching on a light. Unit 3 serves to illuminate how, and why, our various appliances function by exploring the nature and importance of electric currents, circuits, and resistance. Through activities and lab investigations, students will have opportunities to relate knowledge across the course by using the electrical components they learned about in unit 2 and will come to discover in unit 3 to create, modify, and analyze circuits. Students will also analyze the relationships that exist between current, resistance, and power, in addition to exploring and applying Ohm's Law and Kirchhoff's Rules.

Unit 4 - Magnetic Fields
Unit 4 introduces students to magnetism and how magnetic fields are generated, behave, and relate to electricity. Students will learn how magnetic fields impact motion and interact with other magnetic fields. Laboratory investigations and/or activities should be provided for students to apply both the Biot–Savart Law (using calculations to determine the strength of a magnetic field) and Ampère's Law (deriving mathematical relationships which relate the magnitude of the magnetic field to current). This knowledge from previous units helps students to make connections between electric fields and magnetic fields as well as between Gauss's Law and Ampère's Law.

Unit 5 – Electromagnetism
Students examine electromagnetism through the concept of electromagnetic induction and the application of Maxwell's equations. Through activities and detailed laboratory investigations, students will study, apply, and analyze the concept of induction, as well as investigate the relationship between Faraday's Law and Lenz's Law. Additionally, students are expected to call upon their knowledge obtained in earlier units—particularly that of charges, currents, and electric and magnetic fields—to better understand Maxwell's equations and to be able to mathematically demonstrate, as well as reason with, how these fields are generated.

3. Key Assignments:
Twenty-five percent of instructional time is devoted to hands-on laboratory work with an emphasis on inquiry-based investigations. Investigations will require students to ask questions, make observations and predictions, design

experiments, analyze data, and construct arguments in a collaborative setting, where they direct and monitor their progress.

The AP Physics C: E&M exam assesses student application of the science practices and understanding of the learning objectives outlined in the course framework. The exam is 1 hour and 30 minutes long and includes 35 multiple-choice questions and 3 free response questions. A four-function, scientific, or graphing calculator is allowed on both sections of the exam.

4. Instructional Methods and/or Strategies:

Students establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. Focusing on these disciplinary practices enables teachers to use the principles of scientific inquiry to promote a more engaging and rigorous experience for AP Physics students. Such practices require that students:

- Use representations and models to communicate scientific phenomena and solve scientific problems
- Use mathematics appropriately Chino Valley Unified School District High School Course Description Page 3 of 3 – AP Physics 1
- Engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course
- Plan and implement data collection strategies in relation to a particular scientific question
- Perform data analysis and evaluation of evidence
- Work with scientific explanations and theories
- Connect and relate knowledge across various scales, concepts, and representations in and across domains
- Close Reading
- Class Discussions

5. Assessment Including Methods and/or Tools:

The evaluation of student progress and evaluation will be based on the following criteria outlined in Board Policy:

- Assessments: 60-75% of the final grade
- Assignments and class discussions: 25-40% of the final grade