Purpose: It is the intention of this Administrative-Master Syllabus to provide a general description of the course, outline the required elements of the course and to lay the foundation for course assessment for the improvement of student learning, as specified by FBISD, regardless of who teaches the course, the timeframe by which it is instructed, or the instructional method by which the course is delivered. It is not intended to restrict the manner by which an individual faculty member teaches the course but to be an administrative tool to aid in the improvement of instruction.

Course Title	Department	Credits	Course Code	Prerequisites
AP Physics C: Electricity and Magnetism	Science	.75	SC3811	Physics and completion or concurrent enrollment in Calculus

I. PROGRAM INFORMATION

Program Guide Course Description: The AP Physics C course expands on concepts presented in AP Physics 1 and 2, but is limited to the topics of electricity and magnetism. The AP Physics C course is the part of a sequence that is often a very intensive one-year course in college that serves as the foundation in physics for students majoring in the physical sciences or engineering. The AP Physics C course is unique in the fact that the exam is administered as two separate one and one-half hour exams; one in mechanics and the other in electricity and magnetism. A student may take either or both exams and a separate grade is reported for each. Methods of calculus are used wherever appropriate in formulating physical Earth principles and in applying them to physical problems. Laboratory investigations utilize computer applications when possible. This course requires a two hour lab one evening per week. The focus of this course is preparation for successful completion of the AP exam in May.

Primary Textbook: Mazur, Eric, Daryl Pedigo, Peter A. Dourmashkin, and Ronald J. Bieniek. Principles & Practice of Physics. Boston, Mass.: Pearson, 2015. Print.
ISBN 9780321957771 Adoption Period: 2014-2022

Optional Text(s) and/or Materials: N/A

Websites: hyperphysics. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html www.edx.org

Course Overview: The AP Physics C: Electricity and Magnetism course applies both differential and integral calculus, and builds upon the AP Physics C: Mechanics course by providing instruction in each of the following five content areas: • Electrostatics • Conductors, capacitors, and dielectrics • Electric circuits • Magnetic fields • Electromagnetism learning objectives for laboratory and experimental situations. Students establish lines of evidence and use them to develop and refine testable explanations and predictions of natural phenomena. Focusing on these disciplinary practices and experimental skills enables teachers to use the

principles of scientific inquiry to promote a more engaging and rigorous experience for AP Physics C: Electricity and Magnetism students. Such practices or skills require students to • Design experiments • Observe and measure real phenomena • Organize, display and critically analyze data • Analyze sources of error and determine uncertainties in measurement • Draw inferences from observations and data • Communicate results, including suggested ways to improve experiments and proposed questions for further study. A minimum of 20 percent of instructional time is devoted to hands on and inquiry-based laboratory investigations.

[taken from: http://media.collegeboard.com/digitalServices/pdf/ap/ap-course-overviews/ap-physics-c-electricityand-magnetism-course-overview.pdf]

Course Requirements: Concurrently enrolled in Calculus or has completed Calculus

Grading System: The State Board of Education has set 70 as a minimum passing grade. Written communication of the student's achievement is reported to the parents on a nine weeks basis. When letter grades are recorded, the following conversions are used: 90-100 = A, 80-89 = B, 75-79 = C, 70-74 = D, 69-below = F

Actual student numerical grades are recorded in the grade book and averaged as actual grades. An incomplete (I) is given on a report card if a student, because of illness or for some other excused reason, cannot complete the required work by the end of the reporting period. The work must be made up. The student should contact the teacher to arrange to complete the work. All other grading, reteaching, and retesting procedures set by Fort Bend ISD will be followed.

Attendance: Students must be in attendance a minimum of 90 percent of the days after enrollment in the course.

In the event that grading or attendance guidelines conflict with FBISD district policy, the district policy will be followed.

II. MAIN TOPICS: AP Physics C electricity and magnetism is subdivided into 5 main topics. Those 5 main topics are:

1. Electrostatics
2. Conductors, capacitors and dielectrics
3. Electric circuits
4. Magnetic fields
5. Electromagnetism

III. PHYSICS PRACTICES

The aim of AP Physics C courses is to develop the students' abilities to do the following:

1. Read, understand, and interpret physical information – verbal, mathematical, and graphical;
2. Describe and explain the sequence of steps in the analysis of a particular physical phenomenon or problem; that is,
    2a. Describe the idealized model to be used in the analysis of a particular physical phenomenon, including simplifying assumptions where necessary;
    2b. State the concepts or definitions that are applicable in a particular physical phenomenon;
    2c. Specify relevant limitations on applications of principles in a particular physical phenomenon;
    2d. Carry out and describe the steps of an analysis, verbally, mathematically, or graphically;
    2e. Interpret the results or conclusions, including discussion of particular cases of special interest;
3. Use basic mathematical reasoning – arithmetic, algebraic, geometric, trigonometric, or calculus, where appropriate – in a physical situation or problem;
4. Perform experiments and interpret the results of observations, including making an assessment of experimental uncertainties.

IV. LAB INVESTIGATIONS

Lab Requirements: Investigative labs will account a minimum of 20% of the course instruction. Labs emphasize development and testing of the hypothesis, collection, analysis and presentation of data, as well as discussion of results to discover unanswered questions about the particular topics addressed. Two hour evening labs will be held each week. Students will participate in a minimum of 11 labs, aligned to the main topics throughout the full course. Evening labs allow for a rigorous experience and provide students with the tools and experiences needed to be successful in future scientific studies. Students are required to report on all laboratory investigations. The student-directed and inquiry-based laboratory investigations used throughout the course enable students to apply the seven science practices as defined in the Curriculum Framework.

Main Topic	Lab Investigation	Science Practice 1	Science Practice 2a	Science Practice 2b	Science Practice 2c	Science Practice 2d	Science Practice 2e	Science Practice 3	Science Practice 4
1	Coulomb's Law Lab (G) *Students will use an electronic balance to measure the electric force between two charged balls.*	✓	✓	✓	✓	✓	✓	✓	✓
1	Electric field mapping (I) *Students will simulate an arrangement of charge on field plotting paper, plot equipotentials and deduce the electric field by sketching lines perpendicular to the equipotentials.*	✓	✓	✓	✓	✓	✓	✓	✓
1	Parallel-plate capacitor (I) *Students will verify the dependence of capacitance on plate size and spacing for a parallel plate capacitor.*	✓	✓	✓	✓	✓	✓	✓	✓
1,2	Capacitor arrangements (G) *Students will explore how charge and energy are stored on both series and parallel combinations of capacitors.*	✓	✓	✓	✓	✓	✓	✓	✓
3	Ohm's Law (I) *Students will confirm the relationship of current, voltage, and resistance in an electric circuit.*	✓	✓	✓	✓	✓	✓	✓	✓

3	Kirchhoff's Law (I) *Students will explore Kirchhoff's two laws of electrical circuits by measuring the voltage and current across and through parts of a complex circuit.*	✓	✓	✓	✓	✓	✓	✓	✓
3	RC Circuits Lab (G) *Students will calculate the capacitance of the capacitor based on the time to 'half-max' and the resistance of the resistor.*	✓	✓	✓	✓	✓	✓	✓	✓
4	Magnetic Field and μ_0 (I) *Students will determine the value of μ_0 using the magnetic field of a solenoid (coiled spring).*	✓	✓	✓	✓	✓	✓	✓	✓
5	Tangent Galvanometer Lab (G) *Students will use the magnetic field of a coil and deflection of the compass needle to calculate the magnetic field of the earth.*	✓	✓	✓	✓	✓	✓	✓	✓
5	Magnetic Induction (G) *Students will measure the potential difference induced in a coil of wire by a bar magnet dropping through the center of the coil.*	✓	✓	✓	✓	✓	✓	✓	✓
5	RL Lab (G) *Students will conduct a traditional RL circuit lab where the values of R are changed and the effects on the curve are noted. Time constants are determined.*	✓	✓	✓	✓	✓	✓	✓	✓

(I) Inquiry Lab; (G) Guided Inquiry Lab

V. COURSE LEARNING OUTCOMES/CURRICULUM REQUIREMENTS

Grading Period	Learning Objectives	Topics & Activities	1. Read, understand, and interpret physical information – verbal, mathematical, and graphical	2a. Describe the idealized model to be used in the analysis of a particular physical phenomenon, including simplifying assumptions where necessary	2b. State the concepts or definitions that are applicable in a particular physical phenomenon	2c. Specify relevant limitations on applications of principles in a particular physical phenomenon	2d. Carry out and describe the steps of an analysis, verbally, mathematically, or graphically	2e. Interpret the results or conclusions, including discussion of particular cases of special interest	3. Use basic mathematical reasoning – arithmetic, algebraic, geometric, trigonometric, or calculus, where appropriate – in a physical situation or problem	4. Perform experiments and interpret the results of observations, including making an assessment of experimental uncertainties	**Main Topic 1**: Electrostatics	**Main Topic 2**: Conductors, capacitors and dielectrics	**Main Topic 3**: Electric circuits	**Main Topic 4**: Magnetic fields	**Main Topic** 5: Electromagnetism	Calculus Integration	Chapter, Pages	Est. Time Frame
3rd	**Unit 1: Electric forces and field**																	
	III.A.1.a.1 III.A.1.a.2 III.A.1.b.1 III.A.1.b.2 III.A.2.a.1 III.A.2.a.2 III.A.2.a.3 III.A.2.a.4 III.A.2.a.5 III.A.2.a.6 III.A.3.a.1 III.A.3.a.2 III.A.3.a.3 III.A.3.b.1 III.A.3.b.2 III.A.3.b.3 III.A.4.a.1 III.A.4.a.2	**Topics:**																	
		Insulators and Conductors	✓	✓	✓	✓	✓	✓	✓	✓	✓						Ch 22 593-614 Ch 23 615-638 Ch 24 639-662	15 days
		Coulomb's Law	✓	✓	✓	✓	✓	✓	✓	✓	✓							
		Electric Field (point charge and distributions of charge)	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓		
		Gauss's Law	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓		
		Activities:																
		Lab: Coulomb's Law (G)	✓	✓	✓	✓	✓	✓	✓	✓	✓							
		Lab: Electric Field Mapping (I)	✓	✓	✓	✓	✓	✓	✓	✓	✓							

	III.A.4.b.1 III.A.4.b.2 III.A.4.b.3 III.B.1.a.1 III.B.1.a.3 III.B.1.b III.B.1.c.1 III.B.1.c.2 III.B.1.c.3 III.B.1.c.4																	
	Unit 2: Electric potential and Capacitance																	
	III.A.2.b.1 III.A.2.b.2 III.A.2.b.3 III.A.2.b.4 III.A.2.b.5 III.A.2.b.6 III.A.2.b.7 III.A.2.b.8 III.A.4.a.2 III.A.4.a.3 III.A.4.b.4 III.B.1.a.2 III.B.1.b III.B.2.a.1 III.B.2.a.2 III.B.2.a.3 III.B.2.b.1 III.B.2.b.2 III.B.2.b.3 III.B.2.b.4 III.B.2.b.5 III.B.2.b.6 III.B.3.a III.B.3.b	**Topics:**															Ch 25 663-684 Ch 26 684-709	15 days
		Electric Potential Energy	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓		
		Electric Potential (Point charges and Charge distributions	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓		
		Capacitance and Dielectrics (Parallel plate, spherical and cylindrical)	✓	✓	✓	✓	✓	✓	✓	✓		✓						
		Activities:																
		Lab: Electric Potential of Cylindrical charge distributions (G)	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓		
		Lab: Capacitance and Dielectric Lab (I)	✓	✓	✓	✓	✓	✓	✓	✓		✓						
	Unit 3: Electric Circuits																	
	III.C.1.a III.C.1.b.1	**Topics:**															Ch 10 811-841	10 days
		Ohm's Law	✓	✓	✓	✓	✓	✓	✓	✓			✓					

	III.C.1.b.2 III.C.1.b.3 III.C.1.b.4 III.C.1.b.5 III.C.1.b.6 III.C.2.a.1 III.C.2.a.2 III.C.2.a.3 III.C.2.a.4 III.C.2.a.5 III.C.2.b.1 III.C.2.b.2 III.C.2.c.1 III.C.2.c.2 III.C.2.d.1 III.C.2.d.2 III.C.2.d.3 III.C.3.a.1 III.C.3.a.2 III.C.3.a.3 III.C.3.a.4 III.C.3.b.1 III.C.3.b.2 III.C.3.b.3 III.C.3.b.4	(Resistance, Current, and Voltage)																
		Steady state DC Circuits (Resistors only)	✓	✓	✓	✓	✓	✓	✓	✓			✓					
		Capacitors in circuits (Resistors and Capacitors)	✓	✓	✓	✓	✓	✓	✓	✓			✓					
		Transient Process and Steady state of RC circuits	✓	✓	✓	✓	✓	✓	✓	✓			✓			✓		
		Activities:																
		Lab: Ohm's Law Lab (I)	✓	✓	✓	✓	✓	✓	✓	✓			✓					
		Lab: Kirchhoff's Rule Lab (I)	✓	✓	✓	✓	✓	✓	✓	✓			✓					
		Lab: RC Circuit Lab (G)	✓	✓	✓	✓	✓	✓	✓	✓			✓			✓		
4th	**Unit 4: Magnetic Fields**																	
	III.D.1.a III.D.1.b III.D.1.c III.D.1.d III.D.1.e III.D.2.a III.D.2.b III.D.2.c III.D.3.a III.D.3.b III.D.3.c III.D.4.a.1 III.D.4.a.2 III.D.4.b.1	**Topics:**															Ch 27 710-734 Ch 28 735-758	15 days
		Forces on moving charges (in a B-Field)	✓	✓	✓	✓	✓	✓	✓	✓				✓				
		Forces on current carrying wires (in a B-Field)	✓	✓	✓	✓	✓	✓	✓	✓				✓				
		B-Field of a current carrying wire	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓		
		Biot-Savart and Ampere Laws	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓		

	III.D.4.b.2 III.D.4.c	**Activities:**																
		Lab: Magnetic Field and μ_0 (I)	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓		
		Lab: Tangent Galvanometer Lab (G)	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓		
	Unit 5: Electromagnetism																	
	III.E.1.a.1 III.E.1.a.2 III.E.1.b.1 III.E.1.b.2 III.E.1.c III.E.2.a.1 III.E.2.a.2 III.E.2.b.1 III.E.2.b.2 III.E.2.b.3 III.E.2.b.4 III.E.2.b.5 III.E.2.b.6 III.E.3	**Topics:**															Ch 29 759-780 Ch 30 781-810 Ch 32 843-845; 862-869	15 days
		Electromagnetic induction (Faraday's and Lenz's Law)	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓		
		Inductance (LR and LC circuits)	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓		
		Maxwell' Equations	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓		
		Activities:																
		Lab: Magnetic Induction (G)	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓		
		Lab: RL Lab (G)	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓		
	AP Review																	
	All Learning Objectives covered during the year	Review Big Ideas, Practice Free Response, Practice Multiple Choice, Review Labs, Preparation of review note cards																5 days