

AP PHYSICS C: ELECTRICITY & MAGNETISM

Ivy Collegiate School

2021-2022

Instructor:	Patrick Collins	Time:	MTuW 2:10 – 3:10
Email:	patrick@ivycollegiateschool.org	Place:	806 (Science Lab)

Course References: This is a list of various interesting and useful books and online resources that were used in the construction of the course. You are only required to purchase the first text in the list. (Note: They are available in the restricted library.)

- Randall D. Knight, *Physics for Scientists and Engineers*, Pearson, 4th ed., 2016. REQUIRED.
- Richard Feynman, Matthew Sands, and Robert B. Leighton, *The Feynman Lectures on Physics, Vol. 2: Electromagnetism and Matter*, Addison-Wesley, 2nd ed., 2005.
- Robert A. Pelcovits, *Barron's AP Physics C*, Barrons Educational Series, 5th ed., 2020.
- Eugene Hecht, *Schaum's Outline of College Physics*, McGraw-Hill, 12th ed., 2018.
- *PhET Interactive Simulations*, University of Colorado at Boulder, (online resource), <https://phet.colorado.edu/>

Objectives: This course ordinarily forms the second part of the college sequence that serves as the foundation in physics for students majoring in the physical sciences or engineering. The sequence is parallel to or preceded by mathematics courses that include calculus. Methods of calculus are used wherever appropriate in formulating physical principles and in applying them to physical problems. Strong emphasis is placed on solving a variety of challenging problems, some requiring calculus. The subject matter of the AP Physics C: Electricity & Magnetism course is classical in character and includes topics in electric fields and forces, conductance and capacitance, current and resistance, electric circuits, magnetic fields, electromagnetism, and Maxwell's equations, among many other topics.

This course is recommended to students with an interest in math and/or the physical sciences and requires a more rigorous approach to solving problems using math. Students will become well-versed in new methods of applying the language of math to the physical phenomena of our macroscopic world. They will look for symmetry in both their physical understanding of the world around them and in the mathematics on the paper before them.

Co-/Prerequisites: Students are required to have completed or be enrolled in one of the following courses: AP Calculus AB or AP Calculus BC.

Notes on AP courses: AP courses culminate in an examination May with scores ranging from 1 to 5 (5 - Extremely well-qualified; 4 - Well-qualified; 3 - Qualified; 2 - Somewhat qualified; 1 - Not qualified). Students are expected to devote additional time beyond their normal class and homework hours to preparing for this examination. While time for instructor-led review is always allotted during the Spring semester, it is important that students begin their review independently and early. At ICS, AP courses have an additional component in the requirement of the completion of a Capstone Project at the end of the year (in lieu of a traditional Final Examination). More details regarding the Capstone Project(s) may be found below.

AP Physics C: Electricity & Magnetism Course Outline:

Week One	Electric charges & forces
Week Two	Electric fields
Week Three	LAB: Coulomb's Law
Week Four	Gauss's Law
Week Five	Electric potential
Week Six	REVIEW WEEK
Week Seven	Potentials & fields
Week Eight	LAB: Equipotentials and fields
Week Nine	Current & resistance
Week Ten	LAB: Ohm's Law
Week Eleven	Circuits
Week Twelve	LAB: RC Circuits
Week Thirteen	REVIEW WEEK
Week Fourteen	The magnetic field
Week Fifteen	LAB: Biot-Savart Law
Week Sixteen	Electromagnetic induction
Week Seventeen	LAB: Magnetic induction
Week Eighteen	REVIEW WEEK
Week Nineteen	Electromagnetic fields & waves
Week Twenty	AC circuits
Week Twenty-one-Thirty-two	SPRING REVIEW PERIOD
Week Thirty-three-Thirty-seven	CAPSTONE RESEARCH
Week Thirty-eight	CAPSTONE PRESENTATIONS

Grading Policy: Homework and quizzes (60%), Finals and Project (40%)

Capstone Project: The Capstone projects are designed to give you the opportunity to showcase (beyond the examination) what you have learned and the skills you have mastered as part of the course. While every project assignment may be different in scope, target, grading, and type of organization, each is intended to require you to “dig deep” and impress us with your creativity. For this course, you are required to submit an original research paper related to a topic you have learned in class, produce a 30-minute video tutorial on a select topic, or develop a programming project related to a concept from the course. Rubrics will be available in the Spring semester.

Important Dates:

Final Examination	Dec 16, 2021
AP Examination	May 10, 2022
Capstone Deadline	TBD

Course Policy:

- A TI-NSpire CX-CAS is recommended.

Class Policy:

- Regular attendance is essential and expected.
- You will be required to submit your assignments using a math editor or typesetter such as MathType or LaTeX.

Academic Honesty: Students are expected to abide by the policies regarding Academic Honesty as laid out in the ICS Student Handbook. Any violations will be forwarded for administrative review and the possible imposition of academic penalties.