AP® Physics C: Electricity and Magnetism: Syllabus 2

Syllabus 1058807v1

Scoring Components		Page(s)
SC1	The course provides in depth instruction in electricity and magnetism and provides instruction in electrostatics.	3
SC2	The course provides in depth instruction in electricity and magnetism and provides instruction in conductors.	3
SC3	The course provides instruction in electricity and magnetism in depth and provides instruction in capacitors.	4
SC4	The course provides in depth instruction in electricity and magnetism and provides instruction in dielectrics.	4
SC5	The course provides in depth instruction in electricity and magnetism and provides instruction in electric circuits.	4
SC6	The course provides in depth instruction in electricity and magnetism and provides instruction in magnetic fields.	4
SC7	The course provides in depth instruction in electricity and magnetism and provides instruction in electromagnetism.	5
SC8	Introductory differential and integral calculus are used throughout the course.	2
SC9	The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.	2
SC10	Students spend a minimum of 20% of instructional time engaged in laboratory work.	2
SC11	A hands-on laboratory component is required.	2
SC12	Each student should complete a lab notebook or portfolio of lab reports.	2–3

Lecture–Discussion: Monday, Wednesday, Friday. 50 minutes each. Two-hour labs: Tuesdays.

Text

Resnick, Halliday, and Krane*, Physics: Vols. I and 2, 5th Ed. New York: John Wiley* [SC8]

SC8—Introductory differential and integral calculus are used throughout the course.

AP Physics C is a national calculus-based course in physics. The learning objectives for this course are developed by the College Board. This course is equivalent to the pre-engineering introductory physics course for college and university students. The course emphasizes understanding concepts and skills and using those concepts and formulae to solve problems. Laboratory work is an integral part of this course. Students engage in inquiry-based activities to develop their understanding of the material of the course. Students work together in small groups to solve problems. Students present solutions to the class. **[SC9]**

SC9—The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.

Final Grade

Final grade will be determined from the combination of the following scores.

Quizzes	40%
Homework	20%
Labs	20%
Final Exam	20%

Labs: A two-hour hands-on laboratory component occurs every week. **[SC10 & SC11]** Teachers grade the lab report on the student's participation in the actual experiment and the written report.

SC10—Students spend a minimum of 20% of instructional time engaged in laboratory work.

SC11—A hands-on laboratory component is required.

Students must save all the graded lab reports. They will need to present the saved lab reports as a proof of having done these labs when they seek credit for this course in college. **[SC12]**

SC12—Each student should complete a lab notebook or portfolio of lab reports.

Students will perform all nine of the following lab experiments.

1. Electrostatics — Ordering the given materials in the order of their electronegativity
2. Mapping Electric Fields: Plotting equipotential and field lines; 3-D landscape
3. Ohm's Law and Internal Resistance of a Battery
4. Properties of Series and Parallel Resistive Circuits
5. RC Circuit — Build the circuit and find the time-constant by curve fitting techniques
6. Magnetic Field Lines — prediction and plotting for various magnetic configurations
7. Ampere's Law — Straight wire and circular-current loop
8. Magnetic Field Due to a Slinky — Use Hall probe
9. Determination of BH for the Earth's Magnetic Field

Each lab will require:

- The formation of an hypothesis or hypotheses, based on in-class discussion of the presented problem or focus of each experiment
- Design of an experiment, also based on in-class discussion, to test the hypothesis or hypotheses
- Collection of data and observations
- Calculations using the collected data
- Conclusions about how well the hypothesis or hypotheses held up based on the experiment(s)
- Class discussion of variance and error analysis
- Written report **[SC12]**

SC12—Each student should complete a lab notebook or portfolio of lab reports.

January 8–15

Electric Charge [SC1]

- Coulomb's Law
- Conductors and Insulators
- Conservation of Charge

SC1—The course provides in depth instruction in electricity and magnetism and provides instruction in electrostatics.

January 16–24

Electric Field (E) [SC1]

- Due to a Point Charge
- Due to Charge Distribution
    - Discrete
    - Continuous
- Electric Field Lines
- Electric Dipole

January 25–31

Gauss' Law [SC2]

- Area Vector
- Electric Flux
- Gauss' Law Applications

SC2—The course provides in depth instruction in electricity and magnetism and provides instruction in conductors.

February 1–16

Electric Potential Energy (UE) and Potential (V)

- Electric Potential Energy
    - Two-Point System

    - Many-Particle System
- Electric Potential (V)
    - Point Charge
    - Charge Distribution
    - Discrete
    - Continuous
- Relationship Between V and E
- Electrical Properties of a Charged Conductor

February 19–28

Capacitance [SC3]

SC3—The course provides instruction in electricity and magnetism in depth and provides instruction in capacitors.

- Capacitor
- Capacitance of
    - Parallel Plate Capacitor
    - Cylindrical Capacitor
    - Spherical Capacitor
- Capacitors in Series and Parallel
- Energy Stored in Capacitor
- Energy Stored in Electric Field
- Capacitors with Dielectric **[SC4]**

SC4—The course provides in depth instruction in electricity and magnetism and provides instruction in dielectrics.

March 1–9

DC Circuits [SC5]

SC5—The course provides in depth instruction in electricity and magnetism and provides instruction in electric circuits.

- Electric Current
- Ohm's Law
- Resistors in Series and Parallel
- Energy Transfer
- Kirchoff's Rules
- RC Circuits

SC6—The course provides in depth instruction in electricity and magnetism and provides instruction in magnetic fields.

March 19–26

Magnetic Fields [SC6]

- Magnetic Interactions
- Magnetic Poles or Lack Thereof
- Magnetic Force on a Moving Charge

- Circulating Charge
- Magnetic Force on Electric Current
- Electric Motor

March 27–Apr 3

Magnetic Field Due to Electric Current [SC7]

SC7—The course provides in depth instruction in electricity and magnetism and provides instruction in electromagnetism.

- Long Straight Wire
- Circular Loop
- Solenoid
- Parallel Wires
- Biot-Savart Law and Applications
- Ampere's Law and Applications

April 4–Apr 18

Faraday's Law of Induction [SC7]

- Electromagnetic Induction
- Lenz's Law Applications
- Electric Generator
- Transformer

April 19–Apr 30

Inductance [SC7]

- Self-inductance
- LR-Circuits
- Energy Stored in a Magnetic Field
- LC-Circuit and Electromagnetic Oscillations

May 1–4

Maxwell's Equations [SC7]

- The Basic Equations of Electromagnetism
- Displacement Current and Ampere's Law
- Maxwell's Equations

Review

May 7–11 Final Exams