

## AP Physics C – Electricity & Magnetism Audit Syllabus



Resources: Textbook – *Physics for Scientists & Engineers* w/ Mastering Physics, 3E; Pearson 2012; by Randall Knight

Supplement – TIPERS: Sensemaking Tasks for Introductory Physics; Pearson 2013; by Hieggelke, Maloney, Kanim, and O’Kuma

Online homework system – Mastering Physics by Pearson

Course Schedule and Structure: This AP Physics C – E&M syllabus describes the yearlong course that the vast majority of students take as a second year of physics. The school calendar is structured in six week grading periods with classes beginning the second week of August each year and continuing until the end of May. The E&M curriculum is a yearlong course. All students must be at least co-enrolled in a calculus course, already have a calculus credit and/or concurrently enrolled in a Differential Equations / Vector Calculus course. Both differential and integral calculus are used throughout the course [**SC08**]. Classes meet on a block schedule for 90 minutes alternating days that cycle every two weeks. Contact days total about 80 prior to the exam administration in mid-May. Students undertake the E&M curriculum from the beginning of the school year until the end of May for a total of 86 class meetings.

The course elements include laboratory exercises, student recitation sessions, some in-class lectures, online homework assignments due approximately four per three weeks and comprehensive unit tests about every 3-4 weeks. Interactive student engagement techniques are used throughout in most elements of the course. For example, when students present solutions in recitation sessions, other students use a rubric for that question to evaluate the solution presented. For a number of the lab exercises students present their results in a poster board session that their classmates evaluate using rubrics. And, after taking each unit test, the free response questions are evaluated anonymously by peer scoring methods using the released CB rubrics for questions that have been released. In each of these scenarios students employ critical thinking in using the rubrics and give their classmates feedback based on the evaluations from the rubrics [**SC09**]. All students maintain a comprehensive lab notebook detailing lab work from the course [**SCI2**].

Unit Outline Calendar & Lab Exercises: The following table demonstrates the scope and sequence of content covered as required by the curricular requirements as laid out in the Scoring Components of the Syllabus Development Guide. Each key area delineated in the Syllabus Development Guide is coded with a colored indicator as shown in the footnote. All labs are hands-on exercises [**SCI1**] except those indicated as *PhET* sims. Labs which require students to develop procedures, analysis methods, or the purpose of the exercise itself are labeled as **GI** for Guided Inquiry [**SC09**].

**SC** – Scoring Component as described in the Syllabus Development Guide for AP Physics C – Mechanics

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<b>Unit 07</b> (6 weeks, ~18 dy)	<b>Electrostatics – Force &amp; Fields</b>
<u>Labs:</u> Coulomb force video lab (1 dy) Electric field line mapping ( <i>PhET</i> sim, 1 dy) Millikan Oil Drop Lab (2 dy)	<u>Topics:</u> Charging processes, properties of conductors and insulators, Coulomb force, 2-D vector analysis, electric fields, electric flux, Gauss' Law [ <b>SC01,02</b> ],

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<b>Unit 08</b> (6 weeks, ~15 dy)	<b>Electrostatics – Potential &amp; Capacitors</b>
<u>Labs:</u> Electric potential mapping (2 dy) <b>GI:</b> Air gap parallel plate capacitor (2 dy)	<u>Topics:</u> Potential difference, absolute potential, Gauss’ Law (again), capacitors (parallel plate, cylindrical, spherical), dielectrics [ <b>SC03,04</b> ]
<b>Unit 09</b> (6 weeks, ~16 dy)	<b>Electric Circuits</b>
<u>Labs:</u> Basic Current Balance (1 dy) Multiloop Circuits (1 dy) <b>GI:</b> RC Circuits (2 dy)	<u>Topics:</u> Current, conductance, resistance, Kirchhoff’s Rules, Ohm’s Law, circuits, capacitors, dielectrics [ <b>SC05</b> ]
<b>Unit 10</b> (6 weeks, ~15dy)	<b>Magnetostatics &amp; Ampere’s Law</b>
<u>Labs:</u> <b>GI:</b> Magnetic fields in a slinky (2 dy) Earth’s Magnetic Field Lab (1 dy)	<u>Topics:</u> Magnetic materials, magnetic fields, Bio & Savart Law, Ampere’s Law, magnetic materials [ <b>SC06</b> ]
<b>Unit 11</b> (6 weeks, ~16 dy)	<b>Electromagnetism &amp; Maxwell’s Eq’ns</b>
<u>Labs:</u> <b>GI:</b> Induction braking carts (1 dy) Introduction to Electromagnetism (2 dy) <b>GI:</b> LR & LC Circuits (2 dy)	<u>Topics:</u> Faraday’s law of induction, motional EMF, Maxwell’s eq’ns and electromagnetic waves [ <b>SC07</b> ]
Total instructional days: ~ 80 Hands-on lab days: 20 (25% lab time) [ <b>SC10</b> ]	