

Syllabus Development Guide: AP Physics C: Electricity and Magnetism

To the AP teacher: Please take full advantage of this guide. It is designed to support you as you develop your syllabus for the AP Course Audit. The guide contains the following sections and information.

Curricular Requirements	The curricular requirements are the core elements of the course. Your syllabus must provide clear evidence that each requirement is fully addressed in your course.	Important Considerations	Aligned with the Evaluation Guidelines, these statements provide advice on the type of evidence your syllabus should include.
Scoring Components	Some curricular requirements consist of complex, multi-part statements. These particular requirements are broken down into their component parts and restated as “scoring components”. Reviewers will look for evidence that each scoring component is included in your course.	Reference	As appropriate, references to specific sections of the official AP Course Description or other pertinent publications are included here.
Key Terms	To ensure the clarity of certain terms or expressions that may have multiple meanings, each of these terms is clearly defined.	Samples of Evidence	For each scoring component, three separate samples of evidence are provided. These statements provide either verbatim samples from actual authorized syllabi or clear descriptions of what acceptable evidence should look like.
Evaluation Guidelines	These are the exact guidelines used by reviewers as they evaluate the evidence in your syllabus. Use these to interpret any requirement you may find ambiguous.		

Curricular Requirements	Scoring Components, Key Terms, Evaluation Guidelines, Important Considerations, References and Samples of Evidence			
<p>Curricular Requirement: The course covers electricity and magnetism in depth and provides instruction in each of the following five content areas outlined in the Course Description: Electrostatics</p>	Scoring Component 1*: : The course provides in depth instruction in electricity and magnetism and provides instruction in electrostatics.			
	*Note Each Curricular Requirement may be subdivided into two or more distinct Scoring Components.			
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)	Reference
	All terminology in the Scoring Component is clear. No clarification is needed.	<p>Mentioning a practice or topic delineated in the scoring component is sufficient evidence when the resource materials collectively address the required content. Specific chapters or sections need not be associated with the practice or topic. In addition, topical concepts need not be presented in the syllabus in any particular order, i.e. they need not be laid out in the strict order of the AP Course Description outline.</p> <p>If the syllabus sufficiently cites (author, title, and edition) textbooks or materials included in the College Board's example textbook lists and the practice or topic in the scoring component is identified as being taught, then the scoring component has been satisfied.</p>	<p>Topics including charged particles, electric forces and fields, and Coulomb's and Gauss's laws should be addressed in the syllabus.</p> <p>The syllabus may mention Gauss's law in the context of conductors or capacitors and, in addition, it may mention electric fields in the context of capacitors.</p>	For more information please see pages 10-11 and 13 of the AP Physics C: Electricity and Magnetism Course Description.
	Samples of Evidence			
	Sample 1	Sample 2	Sample 3	
The syllabus explicitly mentions electrostatics and provides sufficient resources that address this topic.	The syllabus explicitly and briefly describes a required lab(s) in electrostatics.	The syllabus explicitly mentions electrostatics and provides a list with a brief description of the required lab(s) conducted pertaining to this topic.		

Scoring Component 2: The course provides in depth instruction in electricity and magnetism and provides instruction in conductors.					
Curricular Requirement: The course covers electricity and magnetism in depth and provides instruction in each of the five content areas outlined in the Course Description, the second of which is Conductors, capacitors, and dielectrics.	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)	Reference	
		<p>Conductors: in the context of electrostatics, the study of conductors refers to the study of the electric field in and around isolated conductors. In addition, the description of conductors refers to the use of Gauss's law arguments to describe the equilibrium response of a conductor to an external electric field.</p>	<p>Mentioning a practice or topic delineated in the scoring component is sufficient evidence when the resource materials collectively address the required content. Specific chapters or sections need not be associated with the practice or topic. In addition, topical concepts need not be presented in the syllabus in any particular order, i.e. they need not be laid out in the strict order of the AP Course Description outline.</p> <p>If the syllabus sufficiently cites (author, title, and edition) textbooks or materials included in the College Board's example textbook lists and the practice or topic in the scoring component is identified as being taught, then the scoring component has been satisfied.</p> <p>Sufficient evidence may be found if conductors are implied through other terminology when capacitors and dielectrics are mentioned explicitly. If capacitors and dielectrics are not mentioned explicitly, then the evidence is not sufficient.</p>	<p>The syllabus should not mention conductors as part of electric circuits.</p> <p>Evidence should be demonstrated by explicitly mentioning Gauss's law in the context of capacitors to satisfy this scoring component.</p>	<p>For more information please see page 13 of the AP Physics C: Electricity and Magnetism Course Description.</p>
	Samples of Evidence				
	Sample 1	Sample 2	Sample 3		
	The syllabus explicitly mentions the study of conductors in equilibrium in an external electric field, and provides sufficient resources that address the topic.	The syllabus explicitly mentions Gauss's law applied to conductors, and provides sufficient resources that address the topic.	The syllabus explicitly mentions conductors either in equilibrium or in an external electric field, and provides sufficient resources that address the topic.		

Scoring Component 3: The course provides instruction in electricity and magnetism in depth and provides instruction in capacitors.			
Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)	Reference
<p>Curricular Requirement: The course covers electricity and magnetism in depth and provides instruction in each of the five content areas outlined in the Course Description, the second of which is Conductors, capacitors, and dielectrics.</p>	<p>All terminology in the Scoring Component is clear. No clarification is needed.</p>	<p>Mentioning a practice or topic delineated in the scoring component is sufficient evidence when the resource materials collectively address the required content. Specific chapters or sections need not be associated with the practice or topic. In addition, topical concepts need not be presented in the syllabus in any particular order, i.e. they need not be laid out in the strict order of the AP Course Description outline.</p> <p>If the syllabus sufficiently cites (author, title, and edition) textbooks or materials included in the College Board's example textbook lists and the practice or topic in the scoring component is identified as being taught, then the scoring component has been satisfied.</p> <p>Sufficient evidence may be found if conductors are implied through other terminology when capacitors and dielectrics are mentioned explicitly. If capacitors are not mentioned explicitly, then the evidence is not sufficient.</p>	<p>Scoring Component is clear and explicit. No Important Considerations are needed.</p> <p>For more information please see pages 10-11 and 13 of the AP Physics C: Electricity and Magnetism Course Description.</p>
	Samples of Evidence		
	Sample 1	Sample 2	Sample 3
<p>The syllabus explicitly mentions capacitors and provides sufficient resources that address the topic.</p>	<p>The syllabus explicitly and briefly describes a required lab(s) in capacitors</p>	<p>The syllabus explicitly mentions capacitors and provides a list with a brief description of the required lab(s) conducted pertaining to this topic.</p>	

<p>Curricular Requirement: The course covers electricity and magnetism in depth and provides instruction in each of the five content areas outlined in the Course Description, the second of which is Conductors, capacitors, and dielectrics.</p>	Scoring Component 4: The course provides in depth instruction in electricity and magnetism and provides instruction in dielectrics.			
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)	Reference
	All terminology in the Scoring Component is clear. No clarification is needed.	<p>Mentioning a practice or topic delineated in the scoring component is sufficient evidence when the resource materials collectively address the required content. Specific chapters or sections need not be associated with the practice or topic. In addition, topical concepts need not be presented in the syllabus in any particular order, i.e. they need not be laid out in the strict order of the AP Course Description outline.</p> <p>If the syllabus sufficiently cites (author, title, and edition) textbooks or materials included in the College Board's example textbook lists and the practice or topic in the scoring component is identified as being taught, then the scoring component has been satisfied.</p> <p>Sufficient evidence may be found if conductors are implied through other terminology when capacitors and dielectrics are mentioned explicitly. If dielectrics are not mentioned explicitly, then the evidence is not sufficient.</p>	Scoring Component is clear and explicit. No Important Considerations are needed.	For more information please see pages 10-11 and 13 of the AP Physics C: Electricity and Magnetism Course Description.
	Samples of Evidence			
	Sample 1	Sample 2	Sample 3	
The syllabus explicitly mentions dielectrics and provides sufficient resources that address the topic.	The syllabus explicitly and briefly describes a required lab(s) in dielectrics.	The syllabus explicitly mentions dielectrics and provides a list with a brief description of the required lab(s) conducted pertaining to this topic.		

Scoring Component 5: The course provides in depth instruction in electricity and magnetism and provides instruction in electric circuits.				
Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)	Reference	
<p>Curricular Requirement: The course covers electricity and magnetism in depth and provides instruction in each of the five content areas outlined in the Course Description, the third of which is Electric circuits.</p>	<p>All terminology in the Scoring Component is clear. No clarification is needed.</p>	<p>Mentioning a practice or topic delineated in the scoring component is sufficient evidence when the resource materials collectively address the required content. Specific chapters or sections need not be associated with the practice or topic. In addition, topical concepts need not be presented in the syllabus in any particular order, i.e. they need not be laid out in the strict order of the AP Course Description outline.</p> <p>If the syllabus sufficiently cites (author, title, and edition) textbooks or materials included in the College Board's example textbook lists and the practice or topic in the scoring component is identified as being taught, then the scoring component has been satisfied.</p> <p>When the sub-topics outlined in the AP Course Description are not identified within the scoring component, they are not considered requisite. Syllabi do not need incontrovertible proof of every portion of a topic as listed in the AP Course Description.</p>	<p>The syllabus should provide evidence that circuit components (capacitors, resistors, batteries) are addressed either by an explicit statement or by a description of a laboratory experiment on electric circuits.</p> <p>The syllabus should demonstrate evidence of Ohm's Law by mentioning the current, voltage and resistance in circuit without explicitly stating, "Ohm's Law."</p> <p>The syllabus should demonstrate evidence of the study of electric circuits by mentioning Kirchoff's rules.</p>	<p>For more information please see pages 10-11 and 13 of the AP Physics C: Electricity and Magnetism Course Description.</p>
	Samples of Evidence			
	Sample 1	Sample 2	Sample 3	
<p>The syllabus explicitly mentions electric circuits, and provides sufficient resources that address the topic.</p>	<p>The syllabus explicitly mentions the study of Ohm's Law and Kirchoff's Rules, and provides sufficient resources that address the topic.</p>	<p>In the laboratory component of the course an experiment or set of experiments is described which involves electric circuits with and which clearly addresses the topic of electric circuits completely.</p>		

Curricular Requirement: The course covers electricity and magnetism in depth and provides instruction in each of the five content areas outlined in the Course Description, the fourth of which is Magnetic fields.	Scoring Component 6: The course provides in depth instruction in electricity and magnetism and provides instruction in magnetic fields.				
	Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)	Reference	
		<p>All terminology in the Scoring Component is clear. No clarification is needed.</p>	<p>Mentioning a practice or topic delineated in the scoring component is sufficient evidence when the resource materials collectively address the required content. Specific chapters or sections need not be associated with the practice or topic. In addition, topical concepts need not be presented in the syllabus in any particular order, i.e. they need not be laid out in the strict order of the AP Course Description outline.</p> <p>If the syllabus sufficiently cites (author, title, and edition) textbooks or materials included in the College Board's example textbook lists and the practice or topic in the scoring component is identified as being taught, then the scoring component has been satisfied.</p> <p>When the sub-topics outlined in the AP Course Description are not identified within the scoring component, they are not considered requisite. Syllabi do not need incontrovertible proof of every portion of a topic as listed in the AP Course Description.</p> <p>The description must explicitly mention magnetic forces and fields.</p>	<p>The syllabus should include explicit mention Bio-Savart Law and Ampère's Law. However, the syllabus may mention magnetic forces and fields and magnetic fields produced by an electric current in place of Bio-Savart Law and Ampere's Law to suffice this scoring component.</p>	<p>For more information please see pages 10-11 and 14 of the AP Physics C: Electricity and Magnetism Course Description.</p>
	Samples of Evidence				
Sample 1	Sample 2	Sample 3			
<p>The syllabus explicitly mentions magnets, magnetic fields and forces, Ampère's Law, the Law of Biot and Savart, and a vanishing magnetic flux through a closed surface and provides sufficient resources that address these topics.</p>	<p>The syllabus explicitly mentions magnets, magnetic fields and forces, and vanishing magnetic flux through a closed surface and provides sufficient resources that address these topics.</p>	<p>The syllabus explicitly mentions magnets, Ampère's Law and the Biot-Savart Law, and provides sufficient resources that address these topics.</p>			

Scoring Component 7: The course provides in depth instruction in electricity and magnetism and provides instruction in electromagnetism.			
Key Term(s)	Evaluation Guideline(s)	Important Consideration(s)	Reference
<p>Curricular Requirement: The course covers electricity and magnetism in depth and provides instruction in each of the five content areas outlined in the Course Description, the fifth of which is Electromagnetism.</p>	<p>Electromagnetism: electromagnetic induction.</p>	<p>Mentioning a practice or topic delineated in the scoring component is sufficient evidence when the resource materials collectively address the required content. Specific chapters or sections need not be associated with the practice or topic. In addition, topical concepts need not be presented in the syllabus in any particular order, i.e. they need not be laid out in the strict order of the AP Course Description outline.</p>	<p>The syllabus should demonstrate evidence of electromagnetic induction by an explicit statement.</p>
		<p>If the syllabus sufficiently cites (author, title, and edition) textbooks or materials included in the College Board's example textbook lists and the practice or topic in the scoring component is identified as being taught, then the scoring component has been satisfied.</p>	<p>The syllabus should address Faraday's law and/or Lenz's law through an explicit statement.</p>
		<p>When the sub-topics outlined in the AP Course Description are not identified within the scoring component, they are not considered requisite. Syllabi do not need incontrovertible proof of every portion of a topic as listed in the AP Course Description.</p>	<p>The syllabus should explicitly mention Maxwell's Equations.</p>
Samples of Evidence			
Sample 1	Sample 2	Sample 3	
<p>The syllabus addresses electromagnetic induction, Maxwell's Equations and provides sufficient resources that address these topics.</p>	<p>The syllabus explicitly mentions electromagnetic induction; Maxwell's Equations and provides sufficient resources that address these topics.</p>	<p>The syllabus explicitly mentions electromagnetic induction; Maxwell's Equations and provides sufficient resources that address these topics.</p>	

Curricular Requirement: Introductory differential and integral calculus is used throughout the course.	Scoring Component 8: Introductory differential and integral calculus are used throughout the course.			
	Key Terms	Evaluation Guidelines	Important Considerations	Reference
	All terminology in the Scoring Component is clear. No clarification is needed.	If a calculus course is mentioned as a pre- or co-requisite, or if a calculus-based textbook is identified, then this scoring component is met.	Scoring Component is clear and explicit. No Important Considerations are needed.	For more information please see page 10-11 of the AP Physics C: Electricity and Magnetism Course Description.
	Samples of Evidence			
	Sample 1	Sample 2	Sample 3	
The introductory paragraph of the syllabus explicitly states that, "Students use introductory and integral calculus throughout the course. All students taking Physics C: Electricity and Magnetism must take a prerequisite course in calculus."	On the first page of the syllabus, under the section titled, "Bibliography," the syllabus accurately sites a sufficient calculus textbook. Additionally, the use of calculus is evidenced through brief descriptions of activities presented in the outline of the syllabus that require the use of calculus.	On page one in the second paragraph the syllabus states, "Calculus is used throughout the course and students are required to apply calculus when completing laboratory work, activities, assignments, homework and exams." Moreover, the syllabus sites a calculus textbook in the bibliography section located on the first page of the document.		

Scoring Component 9: The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.				
Curricular Requirement: The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.	Key Terms	Evaluation Guidelines	Important Considerations	Reference
	<p>Guided inquiry:The instructor guides students to make discoveries and develop knowledge about topics/questions presented in class. Students develop the strategies and methods for investigating and/or understanding the topic/question at hand.</p> <p>Student-centered learning: Students are actively engaged in the learning process, not exclusively passive receivers of information from the instructor. A variety of learning styles are accommodated by the pedagogies employed.</p> <p>Critical thinking: the ability to define, clarify, make judgments, and draw conclusions on conceptual problems. Students are required to think beyond the rote facts and basic problem solving skills both individually and through class discussion.</p>	<p>The syllabus must include some description of how students will meet these objectives. Evidence for the component may include: a discussion of teaching objectives/goals, descriptions of homework assignments, demonstrations, computer-based discussion boards, or lab activities with open-ended questions.</p>	<p>While evidence of guided inquiry and student-centered learning can be demonstrated in a variety of ways, instructors are encouraged to provide a brief description of the nature of the course to illustrate how these two learning objectives are accomplished.</p>	<p>For more information please see page 10 of the AP Physics C: Electricity and Magnetism Course Description.</p>
	Sample 1	Sample 2	Sample 3	
<p>By designing a hands-on investigation to answer a scientific question, students are required to confront a problem and solve it in an active, cooperative learning setting.</p>	<p>Students work in groups on pencil-and-paper to solve real world problems. For example, students determine combinations of appliances that may be used simultaneously without tripping a circuit breaker.</p>	<p>Students are asked to make a prediction about a physical system. The instructor then demonstrates the system for the class and then leads the class in discussion.</p>		

<p>Curricular Requirement: The course includes a laboratory component comparable to a semester-long, college-level physics laboratory. Students spend a minimum of 20 percent of instructional time engaged in laboratory work. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.</p>	Scoring Component 10: Students spend a minimum of 20% of instructional time engaged in laboratory work.			
	Key Terms	Evaluation Guidelines	Important Considerations	Reference
	All terminology in the Scoring Component is clear. No clarification is needed.	<p>This scoring component can be met either by an explicit statement and/or by an easy calculation of class schedule and class time engaged in laboratory work. Contradicting evidence will not fulfill this scoring component.</p> <p>If Physics C: Electricity and Magnetism is taught in conjunction with Physics C: Mechanics, then 20% of instructional time must be dedicated to laboratory work pertaining to Electricity and Magnetism.</p>	Scoring Component is clear and explicit. No Important Considerations are needed.	For more information please see page 7-11 of the AP Physics C: Electricity and Magnetism Course Description.
	Samples of Evidence			
	Sample 1	Sample 2	Sample 3	
The syllabus includes a list of required labs, the duration of the class, along with the approximate time spent completing each lab. With an easy calculation, one can determine that the total time spent engaged in laboratory work is 20% of class time.	The syllabus explicitly states at least one full class period a week is devoted to labs and a list of required labs is provided.	In addition to listing the required labs, the syllabus explicitly states the total number of hours spent in class and the total number of lab hours. The ratio of lab time to total contact hours is a minimum of 20%.		

Scoring Component 11 : A hands-on laboratory component is required.				
	Key Terms	Evaluation Guidelines	Important Considerations	Reference
<p>Curricular Requirement: The course includes a laboratory component comparable to a semester-long, college-level physics laboratory. Students spend a minimum of 20 percent of instructional time engaged in laboratory work. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.</p>	<p>Hands-on Laboratory: an interactive experience during which students directly observe and manipulate physical objects, materials, organisms, or phenomena in order to fulfill the learning objectives of a laboratory experience. These objectives include, but are not limited to, generating and exploring answers to experimental questions, gathering data and making observations, drawing and evaluating conclusions, and thinking and communicating effectively about science.</p>	<p>If the hands-on lab* component meets the instructional time requirement and fulfills the objectives described in the Course Description, then the scoring component is satisfied—even if the lab contains additional virtual, simulated, or teacher-led lab investigations.</p> <p>Virtual and teacher-led demonstrations should be considered neither a virtual nor hands-on lab experience in and of themselves, though these elements may enhance the course's primary laboratory component.</p> <p>Stating that the labs are hands on is sufficient, however, the hands-on nature of the experiments should be obvious in the description of the experiment.</p>	<p>Scoring Component is clear and explicit. No Important Considerations are needed.</p>	<p>For more information please see page 7-11 of the AP Physics C: Electricity and Magnetism Course Description.</p>
	Samples of Evidence			
	Sample 1	Sample 2	Sample 3	
<p>The syllabus explicitly states that all required labs are hands-on.</p>	<p>The syllabus explicitly states that the hand-on labs alone meet the minimum 20% of instructional time.</p>	<p>The syllabus explicitly states that all required labs are hands-on and further demonstrates evidence by providing a description of the labs completed throughout the course.</p>		

<p>Curricular Requirement: The course includes a laboratory component comparable to a semester-long, college-level physics laboratory. Students spend a minimum of 20 percent of instructional time engaged in laboratory work. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.</p>	Scoring Component 12 : Each student should complete a lab notebook or portfolio of lab reports.			
	Key Terms	Evaluation Guidelines	Important Considerations	Reference
	<p>Portfolio: indicates a collection of lab reports. It does not have to be an actual physical portfolio. Formal lab reports are acceptable as well as lab notebooks in which entries are made as the lab activities are performed (mirroring the lab notebook that a practicing physicist would keep).</p>	<p>Each student must complete a lab notebook or portfolio of lab reports in order to meet the scoring component.</p>	<p>Scoring Component is clear and explicit. No Important Considerations are needed.</p>	<p>For more information please see pages 9 and 11 of the AP Physics C: Electricity and Magnetism Course Description.</p>
	Samples of Evidence			
	Sample 1	Sample 2	Sample 3	
<p>The syllabus explicitly states, "students are required to complete written lab reports to be compiled in a lab notebook or portfolio."</p>	<p>The syllabus explicitly states, "students are required to use a lab notebook for their labs."</p>	<p>At the beginning of the lab section, the syllabus states, "Students are required to keep a lab portfolio during the duration of the class. All work completed and relating to labs will be kept in this portfolio throughout the year. Additionally, students turn in their portfolios from time to time to receive a grade from the instructor."</p>		