

ROBERT S. WELCH CENTER FOR GRADUATE AND PROFESSIONAL STUDIES
GOUCHER COLLEGE
TEACHERS' INSTITUTE
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SYLLABUS

AP 594.200 Preparing Students for AP Physics 2: Algebra-Based

June 27 - June 30, 2022

Monday - Thursday 7:30 a.m. - 4:00 p.m.

Text: AP Professional Development for Physics Handbook, AP Physics 2 Course & Exam Description

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Preparing Students for Advanced Placement® Physics 2

This AP Physics institute is designed to help teachers build a foundation for a successful AP Physics program. We will focus on teaching the AP Physics 2 course that began in the 2014/2015 school year and on preparing students for the test. The first goal involves using the Course and Exam Description which pairs essential knowledge with the fundamental scientific reasoning skills necessary for scientific inquiry. The CED provides detailed information concerning what a student should know and what they are expected to do on the AP Physics 2 Exam. A significant amount of time will be spent considering how the new course does not just change what we teach but also changes how we teach. Other focus areas of this course include preparing a new syllabus for AP Physics 2 and organizing the inquiry laboratory experiments/questions that comprise 25% of the time to be spent in the new course. Special topics related to the revamped course —pV diagrams and probability, entropy, electrical circuits with capacitors at steady state and topics in Modern Physics—will be addressed as well. Copies of the AP Physics 2 CED will be provided in the AP Physics Participants handbook. Copies of the CED also may be downloaded from the College Board website prior to the course. Participants are invited to bring their laptop, tablet, or smartphone along with their best activities, lessons, or labs to share with the group.

In this course participants will

1. Develop a year-long plan that includes every unit along with review time.
2. Develop a detailed plan for one unit.
3. Become familiar with the AP Physics 2: Algebra-Based curriculum standards and develop a course syllabus that reflects these new standards.
4. Adapt in-class questioning styles to match the style of the AP exam.
5. Construct AP level multiple choice questions and problems.
6. Get hands-on experience with a variety of laboratories.
7. Modify their existing lab program to reflect the new emphasis on a more open-ended, inquiry-based approach.
8. Network with other teachers and share “best practice” lessons.

Daily Agenda

Day One

- 0.5 hr **Welcome to the Workshop**
Everyone came here looking for something different. This is your chance to share what would make this the perfect APSI experience for you so that you can go home prepared and inspired at the end of the week.
- 1 hr **Under Pressure**
We'll use common tools to measure air pressure and depth. Then we'll make a graph that will help us find the density of air.
- 1 hr **Fluids Labs and Demonstrations**
We'll look at two different demonstrations that involve plastic bottles, develop a bucket-filling challenge, and explore some simple Bernoulli demonstrations. For folks who need some brushing up on Fluids, we'll do a quick review of important topics.
- 1 hr **The Course and Exam Description**
We'll take our first looks at the course and exam description documents. This collection of documents contains the curriculum, test specifications, and pedagogical strategies.
- 1 hr **Electrostatics Demonstrations and the Generator**
Among other electricity demonstrations, we'll estimate the charge on a generator using simple lab equipment.
- 1 hr **Sparking Scientific Argumentation**
We'll use various instant-response polling techniques that can get science conversations going in your classroom. I'll show some techniques my students like; please share yours too!
- 1 hr **Straws and Strips**
We'll lay a conceptual framework for the nature of resistance and the idea of combining resistors. Then we'll gather data to refine our models. Finally, we'll learn how to get students thinking about combining resistors mathematically.
- 1 hr **Making YOUR Unit Plan**
On the last day of the APSI, you and your partners will give a short presentation about just one unit. You'll be discussing what content and skills are in the unit and any content that seems to be missing. You'll share an example of a lab that really fits the theme of the unit. You'll also share an FRQ that fits the content and skills of the unit. In addition, please share any great labs, resources, or ideas you have about the unit.

Day Two

- 0.75 hr **Homework Discussion**
We'll check the solutions for last night's homework and discuss the sort of classroom experiences that would help students learn the skills they'd need to be successful on that homework.
- 1 hr **Capacitor Lab Rotations**
We'll use mostly common tools to examine how separation distance affects capacitance, how area affects capacitance, how voltage affects energy, and how capacitance affects energy.
- 0.5 hr **Making a Unit Plan**
AP Physics is probably not like any Physics course you've taken before. I'll share how I design a unit and the sort of activities I make sure to include. We'll focus on how including these aspects of the course makes AP Physics unique.
- 0.75 hr **The AP Physics Test**
The structure and format of the AP test are the same every year. Teachers who understand how the test is built can help their students throughout the year as they prepare for May. Your students will never say, "I had no idea this would be on the test." We'll look at each of the free response question types and discuss activities to prepare for them.
- 0.5 hr **Navigating AP Classroom**
AP Classroom is a suite of online resources including a question bank, short video tutorials, and formative assessments. This quick introduction will show you around the site and give you a chance to see what each section looks like.
- 1 hr **AP Daily**
A team of AP Physics teachers, each an experienced reader, created this suite of videos. Each video is laser focused on just one topic from the curriculum. You can assign these videos to your students so that they show up to class prepared to start working.
- 1 hr **Using AP Classroom**
We'll use some of the primary features of AP Classroom. We'll make a content-based assessment and try out the various ways that work can be assigned. We'll make a skill-based assessment to help students develop a particular skill.
- 1 hr **Making a Year-Long Plan**
In practical terms, you need to leave this workshop with a plan for the year. You'll use this time to create a year-long plan you can share with your students on day one.
- 1 hr **Making YOUR Unit Plan**
On the last day of the APSI, you and your partners will give a short presentation about just one unit. You'll be discussing what content and skills are in the unit and any content that seems to be missing. You'll share an example of a lab that really fits the theme of the unit. You'll also share an FRQ that fits the content and skills of the unit. In addition, please share any great labs, resources, or ideas you have about the unit.

Day Three

- 0.75 hr **Homework Discussion**
We'll check the solutions for last night's homework and discuss the sort of classroom experiences that would help students learn the skills they'd need to be successful on that homework.
- 1 hr **Magnetism Lab Rotation**
I'll show you a virtual lab you can use to find the magnetic field around a long wire. Then we'll investigate the field within a slinky, operate a doorbell, and figure out which end of a magnet is north. My students love this day-long activity, and so will yours.
- 0.75 hr **Induced EMF**
A pair of nested coils and a function generator can demonstrate Faraday's law.
- 1.5 **Three Simultaneous Optics Labs**
Work through two of these fun labs.
- Refraction Lab**
A common task for students to tackle on the exam is to calculate a material's index of refraction using a graph. We'll do this lab with a new twist and look at examples from the AP exam.
- Lens Labs**
Your students will have to calculate a lens's focal length using a graph of image distance and object distance. We will perform the lab and linearize the data and then consider examples of this from past AP exams.
- Diffraction Lab**
We'll precisely measure a laser's wavelength and make several other fine measurements.
- 0.5 hr **Lab Presentations**
What did your group figure out? How could you use this / adapt this in your class?
- 1 hr **Magnetic Field, Magnetic Field, Induced EMF, and Lenz's Law**
The relationship between magnetism and electricity is complicated and unintuitive. We'll discuss methods for teaching these complicated topics.
- 1 hr **Measurement, Assessment, and Grading**
AP classes are both high school classes and university classes. We are privileged to work with the most driven students in our schools and teach the most interesting topics. During this hour, we'll discuss some ways to assess science students in the AP classroom and how to record scores for those assessments in a way that both helps students grow and gives them an accurate idea of how well they're doing in the class.
- 1 hr **Making YOUR Unit Plan**
On the last day of the APSI, you and your partners will give a short presentation about just one unit. You'll be discussing what content and skills are in the unit and any content that seems to be missing. You'll share an example of a lab that really fits the theme of the unit. You'll also share an FRQ that fits the content and skills of the unit. In addition, please share any great labs, resources, or ideas you have about the unit.

Day Four

- 0.75 hr **Homework Discussion**
We'll check the solutions for last night's homework and discuss the sort of classroom experiences that would help students learn the skills they'd need to be successful on that homework.
- 0.75 hr **Personal Progress Checks**
In addition to the content in the question bank, AP Classroom has Personal Progress Checks. These curated collections of formative questions are for students while they're in the middle of learning a topic.
- 0.75 **TIPERs**
You've looked through the TIPERs library for your own unit, and you have a sense of the question styles they include. We'll take a higher-level tour through the TIPERs collection and discuss how they can be useful in a classroom.
- 1.25 **Diversity and Inclusion**
Participating in academically rigorous coursework exposes our students to challenges and ideas beyond the regular high school curriculum, and it opens doors to post-secondary success. Still, in many schools, the students who end up in AP courses aren't representative of the student body as a whole. My AP Physics class never felt "right" until the students sitting in my classroom looked like a cross section of the students in my school. We'll discuss curriculum adjustments and instructional strategies that will help to recruit and retain underrepresented students. We'll identify classroom-level policies and practices that enhance or restrict student opportunities to participate in AP coursework.
- 1 hr **Leveraging Data from AP Classroom and the Instructional Planning Report**
Assignments you give on AP Classroom, whether from the question bank or from a PPC, will yield a report about how well your students did. These include scores that give you data on individual students as well as whole-class data so you can focus your review on the most-missed items.

Over the summer, you'll get the "Instructional Planning Report" which outlines how your students scored on each topic and skill in the course. We'll look at a sample IPR and discuss how to use it.
- 1 hr **Teacher Best Practices**
Do you have an activity, resource, or idea you'd like to share? If your activity is not part of the unit presentation, we can use this time to share those ideas with the larger group. This hour will be broken into smaller 10-15 minute sessions for teachers to share their great ideas.
- 2 hr **Unit Presentations / Sharing Best Practices**
It's a daunting task to hold all the units of AP Physics in your head at one time. Each group in our APSI has been preparing a presentation to help you wrap your mind around each unit. Groups will give a brief rundown of the unit's content, suggest a lab that captures the essence of the unit, and discuss resources you can use in your own class. We'll share these presentations together so everyone can leave with a bank of great ideas.

Homework

After days 1-3, our homework will be to answer a series of AP Physics 2 test questions about a subset of topics and devise a list of skills and knowledge students will need in order to be successful with those questions. Every teacher will solve all the MC questions while only one group will present their FRQ solutions.

There will be additional and completely optional “office hours” in the evening during which we will work on the homework questions as a group. This time is ideal for questions about content. Typically, these informal sessions offer experienced teachers and new teachers a great way to learn from one another.

This will NOT be a burdensome time investment, yet it will expose teachers to a wide range of question types and topics on the new exam. We will generate a list of activities and lab experiences that will help students generate that knowledge and develop those skills.

College Board AP Teacher Standards

Content Knowledge
Teacher Certification
Pedagogy and Student Learning
Analysis and Reflection
Ongoing Professional Development

Graduate Programs in Education (GPE) Outcomes/Standards

Knowledge Standards

- Apply knowledge of the philosophy related to the area of specialization or certification.
- Demonstrate understanding and the use of assessments appropriate to the area of specialization or certification.
- Demonstrate the knowledge of the concepts of diversity applied to the area of specialization or certification.

Skills Standards

- Use problem solving/critical thinking strategies appropriate to the area of specialization.
- Use reflective practice within the area of specialization.
- Demonstrate effective communication and presentation skills related to the area of specialization.
- Use a variety of technologies appropriate for working in the area of specialization.

Disposition Standards

- Demonstrate positive dispositions toward diversity and equity.
- Demonstrate professionalism in one's demeanor, behavior, conduct, decision-making, and interaction with colleagues.

Grading and Transcript Information

Goucher College does not issue grade reports. You can obtain your grade approximately 3 weeks after concluding the course by going to the Goucher website ([mygoucher](#)) and follow the prompts to receive your grade. If you have misplaced your password, please contact the help desk and they will walk you through this procedure (410-337-6322).

If you need a paper copy of grades for tuition reimbursement, you will need to request a transcript in writing. You can fax your request to Student Administrative Services (SAS) at 410-337-6504 or mail to

Goucher College, SAS
1021 Dulaney Valley Road
Baltimore, MD 21204

There is no charge for this request. Please allow 3-5 working days to process. To access the transcript request form, please go to <http://www.goucher.edu/x1891.xml>

Questions? Please call 410-337-6200.

Requirements for Graduate Credit:

Before August 1st, prepare a timeline for your AP Physics 2 course, and email it to me.

Your timeline should include approximate dates for every topic in the course.

In addition, include a list of every activity and lab your students will be doing along with a brief description of what they students will be doing and why they will be doing it.

Examples: **Archimedes and Buoyancy**

Using only a spring scale and a cup of water, determine the density of an object.

Diffraction Lab

Determine the wavelength of a laser using a diffraction grating.

Graph the relationship between slit spacing and “x” for several objects.

This timeline can form the basis of your AP audit for AP Physics 2.

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Visit <http://www.goucher.edu/information-technology/accounts-and-access/mygoucher> and follow the prompts to receive your grade. If you have misplaced your password, please contact the help desk and they will walk you through this procedure (410-337-6322).

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