

2019/2020 Coconino High School AP Physics 2 Syllabus

Instructor: Christine Sapio
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Email: csapio@fUSD1.org
Room: 705
Class Time: Mon-Fri; 4th & 6th period
AP Exam: May 6, 2020, noon

Course Text and Readings:

Physics: Giancoli, 6th Edition - Prentice Hall Publishing Co.
Kahn Academy courses on selected physics topics
Physicsclassroom.com (physics online tutorial)

Course Prerequisites:

A strong foundation in algebra and trigonometry
A willingness to work hard and a positive attitude

Course Description:

AP[®]Physics 2 is an algebra-based course in fluids, electricity and magnetism, thermodynamics, light and optics, and atomic and nuclear physics. Physics topics presented during the course closely follow those outlined by the College Board and also mirrors an introductory level university physics course. AP[®]Physics 2 is organized around seven big ideas that bring together the fundamental science principles and theories of general physics. These big ideas are intended to encourage students to think about physics concepts as interconnected pieces of a puzzle. The solution to the puzzle is how the real world around them actually works. The students will participate in inquiry-based explorations of these topics to gain a more conceptual understanding of these physics concepts. Students will spend less of their time in traditional formula-based learning and more of their effort will be directed to developing critical thinking and reasoning skills.

Assignments are made of various problems in each unit. Students are encouraged to discuss the problems with a peer study group outside of class and in class when time permits. I try to have students present solutions to problems when class discussion is necessary. Labs will consist of exploratory, concept development, and application phases to build student understanding. Lab work will be written up in a formal laboratory notebook that will be kept for the entire year. Various projects will also be utilized to further enhance student's comprehension. There will be an exam following each unit. The format for the exam will be similar to the format used in the AP Exam – both concept comprehension (*multiple choice*) and concept application (*problems*).

Objectives:

We will learn to recognize/develop fundamental physical laws, and use them to understand the world around us. This will involve solving physics problems using algebra and trig.

Approach:

AP Physics 2 is the equivalent of taking Physics 112 (algebra-based electricity and magnetism) at the university level. It is the companion course to AP Physics 1 (algebra-based mechanics), which will be offered next year. As such, it is imperative that this course be taught at a rigorous level consistent with students can expect to see at the university. University students are expected to take the time to learn material outside of class, and I expect AP students to do the same.

Each night for homework, you will be expected to read the text, view a Kahn Academy lesson, or other selection from another resource. If you do not have access to the internet at home, my lab is available for your use after school from 2:30-4:00 most days. The school and public libraries are also places for you to get free internet access. Reading the text is important and is *YOUR RESPONSIBILITY*.

Class time will be devoted to Laboratory work, class discussions, conceptual exercises, and problem solving. Each activity is designed to aid in understanding the material. Class activities will be prepared under the assumption that you have already read the appropriate material to be discussed that day. Therefore, in class I will try to present a brief summary of most of the chapter topics, and spend additional time on conceptually challenging activities and will model appropriate problem solving. Many times you will be asked to apply the concepts learned via problem solving or laboratory activities in class. You will occasionally have homework

problems to do on your own but often class time will be dedicated to problem solving practice. This philosophy comes from the “I understood it in class, but struggled when I got home” issue that many students face in a challenging course such as this. Keep in mind, *I WILL NOT COVER ALL TOPICS IN LECTURE* and you are accountable for all assigned material, including assigned material not discussed in lecture. *YOU* must read the text, complete all assignments and do the homework to cover all of the material --- I will not spend the entire class reviewing the reading, condensing or regurgitating the text chapters.

Evaluation Methods:

Semester Work: 85% of your final grade

- Measurement/Performance or “Achievement”: 100% (includes laboratory work, weekly quizzes, exams, lab exams, in class discussions, presentations, projects, certain homework problems, or anything that allows you to “Show what you Know”)
- Practice: 0% (includes some homework, in class problem solving)

Final Exam: 15% of your final grade

**Please note that these percentages are mandated by the administration of Flagstaff Unified School District.*

Required Materials:

Each AP Physics student is required to provide:

- (1) 3-ring binder equipped with either loose-leaf paper or a spiral notebook
- (1) Quad-ruled notebook (can be spiral bound or “composition” style)
- (1) Scientific or graphing calculator
- Pencils and blue or black ink pens

Each day you are expected to come to class ready to learn and work. Each student will be required to have their own scientific or graphing calculator. *Cell phones, ipods or other electronic devices are not permitted to be used as calculators!* This is consistent with the calculator policy for the College Board (administrator of the AP Exam).

You will also need a three ring binder dedicated solely to this class. You will be taking notes in class and on the readings and will have daily opening questions and closing reflections for each day. Though notes may be used on quizzes, they will not be used on exams. Instead, you will be provided with the AP Physics Equation and Reference page for use on all exams. This is consistent with how the AP Exam is administered.

Laboratory:

Labs are all “hands-on” and placed throughout the instructional year. Students will spend at least 25% of class time in laboratory investigations. Labs can be either teacher-directed or student-directed/open-ended. During a teacher-directed lab, the students are given instruction on the operation of lab equipment and guidance in the process of the experiment. Student-directed labs are when the students are given an objective, e.g. “Determine the acceleration due to gravity on Earth,” and standard materials needed to conduct a lab. Students are allowed to create their own experimental design and collect data, which can be analyzed through graphical methods. These inquiry-based investigations or student-directed labs have an extra element added to the lab report. After these labs, each student group must present their results to the class and defend their results. They will also evaluate one other group's approach to the problem and offer a critique of their procedures and results.

Typical lab reports will include the following components:

1. Statement of the problem or question
2. Necessary equipment and how it will be used
3. Labeled diagram of equipment set up
4. Discussion of the procedure, including steps taken to reduce error and assumptions
5. Raw data collected from the experiment
6. Known and unknown variables and calculations
7. Data analysis, including graphical analysis
8. Analysis of results, including questions provided by the instructor, error analysis discussion or other summary

The laboratory will play a major portion of your understanding of the course material. It is expected that you will develop concepts and mathematical models in the lab that will be built upon through problem solving and class discussion. All laboratory work will be recorded in a quad-ruled notebook using blue or black ink that you will keep for the entire year. Lab notebooks will be collected periodically and graded, typically a few days before the unit exam. Once a laboratory experiment is complete, you have 48 hours to finish your analysis in your journal for

homework. I will check your journal quickly two days after the lab is complete and stamp your lab. **Any labs that are complete 48 hours after the experiment will receive 2 points extra credit per lab! This is your incentive to stay on top of your journal and to not “wait till the last minute.”**

Though you will often be working in groups to collect data, your analysis is your own. If you miss a lab you still are responsible for coming in to collect your own data. Labs will typically be worth 20 points and contribute to your measurement/performance score, which is 100% of your final grade. Take this seriously and do quality work in your lab journal – during the course of any given unit we will typically do 3-5 laboratory experiments in your journal. *This means the lab work contributes as many points to your grade as your unit exam!*

Exams:

Due to the nature of physics, the examinations will all be cumulative, but will stress the material most recently covered. Exams will include both multiple choice and free response questions. Some exams will test your understanding of the concepts and ask you to demonstrate your knowledge in a practical manner by completing a lab. Exams will be scored based on the AP scale, with equal weighting of multiple choice and free response sections. Students will get a score based on the percentages awarded on the AP exam. Typically, this works in the student’s favor. Each exam is typically worth 100 points and is a major part of your Measurement-Performance score, which is 100% of your final grade.

Quizzes:

There will be a short multiple-choice and problem solving quiz given many Wednesdays since these class periods are shorter. These quizzes will cover the material covered the previous week. Wednesday quizzes will have a collaborative component that you can do with a partner, and an independent component that you will do on your own. Quizzes will include both free response and multiple choice questions. Quizzes will typically be worth 10-20 points and are a part of your measurement/performance score, which is 100% of your final grade. Wednesday Quizzes will not be given during weeks when there is a full unit exam.

Problem Solving:

Problem solving practice is very important, and homework will be given out on a daily basis. Questions come from past AP Physics exams to prepare students for the caliber of problem they can expect on the AP exam. Typically, problem solving will happen in class, but occasionally additional practice will be sent home with the student. Both the students and the instructor will participate in detailed discussion of the homework questions (*and solutions*) in class.

The practice problems are designed to teach you to think critically and solve multi-step problems. As such, it’s in your best interest to complete all problems assigned and to come in for help when needed. Depending on the nature and intention of the problems assigned, problems will either be assigned to Practice (0% of your final grade) or Performance/Measurement (100% of your final grade).

Opportunities to Correct Work:

I understand that these concepts are challenging, and many students will need more time and support to master concepts. In order to help students to learn the concepts as well as possible, I am including the opportunity for students to correct work throughout the unit to improve understanding and earn additional points missed on assignments. This philosophy will be used for problem sets and exams.

Homework: Physics is like a sport or music – you must practice to get good at it! Each student will be issued five Newton Bucks at the beginning of each semester. Students may correct an assignment and attach a Newton Buck to it for the opportunity to earn **full points back**. To be valid, Newton Bucks must be used by meeting the following criteria:

1. The assignment was turned in on time.
2. The assignment was honestly and fully attempted (all questions at least tried).
3. The assignment is redone by the day of the exam for that unit (no corrected homework will be accepted after the exam).
4. Corrections to the assignment are completed on a separate sheet of paper and turned in attached to a valid Newton Buck and the original graded assignment.
5. Corrections include calculations or verbal explanations to why the answer is correct and not just an answer with no work.
6. Lab Journals and quizzes are not eligible to be corrected with Newton Bucks except at teacher discretion (for example, when many students struggled with a particular quiz.)

Students are encouraged to come in and work with me on assignments they wish to correct. Please see the section on make-up work for information on when I’m available for tutoring. Newton Bucks that are not used by the end of

the semester may be turned in for 3 points extra credit each. Considering that many homework assignments will be worth 20 points or more, *it's in the best interest of your grade to use the Newton Bucks to correct work.*

Exams: Students will be given the opportunity to come in and correct questions missed on exams for half credit back. For the sake of exam security, exams must be corrected by appointment with me in my room. There will be a limited time frame for correcting exams (usually 1.5 to 2 weeks.) Criteria for correcting exams:

1. Any question to be corrected must have been honestly attempted during the exam.
2. Corrections to the exam are completed on a separate sheet of paper and turned in attached to the original graded exam. (If you misplace your exam, you may not do test corrections!)
3. Corrections include calculations or verbal explanations to why the answer is correct and not just an answer with no work.

Projects:

Throughout the course we will complete numerous projects that will reinforce the concepts presented in class. These projects are to be completed cooperatively in groups of two to four participants. Projects will be assessed based on performance and student evaluation of the physics involved, often by using video or sensor analysis. Projects will typically be worth 100 points and will be added to your performance/measurement score, which is 100% of your final grade.

Guaranteed Maximum Grade Cutoffs:

A: 90%+ B: 80% to 89% C: 70% to 79% D: 60% to 69% F: Below 60%

I reserve the right to lower grade cutoffs at the end of the course if this seems appropriate, but I will *NOT* raise them. This is not curving; you cannot have your letter grade lowered if you meet any grade cutoff unless you do not satisfactorily complete the labs, or if you are caught cheating.

In general I am a strict grader, but I encourage you to challenge (*privately or in writing*) any grade you are dissatisfied with, and I usually raise challenged grades. When challenging a grade, please attach a brief note to the assignment in question and turn the note and the assignment back in to me. I will never lower your previous grade on any challenged assignment. On any unclear assignment where I am in doubt, I will assign a lower grade and expect you to challenge that grade.

Make-up Work:

If you miss activities with institutional absences or if you encounter other difficulties with the assignments, then please sign up for a time to come in and make up the missed work on the calendar posted on the whiteboard at the front of the classroom. Missed class work must be made up within 3 days of the missed class. Please know that I will do everything I can to help you, but there are days that I'm not available because of other commitments. Communication is key when it comes to getting your work made up – I'm willing to work with you, but I can't help if I don't know what's going on. Your first and best resource to answer the question "What did I miss?" is StudentVue. I typically post a full week's worth of assignments, including problem sets and laboratory directions, most weeks by Thursday afternoon or Friday at the latest. You can download and print your work in StudentVue, and look ahead to see what assignments are coming up. Please take advantage of this wonderful resource.

There will not be a late penalty for work turned in after the due date, however, the assigned work for a unit will not be accepted after the day of the unit exam and will not be eligible for correction with a Newton Buck. ***This includes your lab journal, which will typically be worth nearly as many points as an exam!*** Zeros devastating to your grade: please do your best to turn in ALL your assigned work!

I work hard to stay on top of my grading and to provide feedback to students in a timely manner, so it's best to turn in work on time so you can get help with concepts that you're struggling with prior to the exam. I'm available for help most days after school, and you can sign up for tutoring time on the same calendar posted for make-up work. Other great resources available include Mr. Lyons in the Connections room and the free tutoring provided in the Family Resource center.

Class Conduct:

There will be no grade specifically allocated to behavior. However, I will be collecting identified materials in class on a near-daily basis. I will weigh attendance in the cases of students whose grades are close to but below grade cutoffs at semester's end. It is expected that you will attend class every day and will promptly make-up any missed material. You are expected to arrive at class prior to the bell and excessive tardiness will not be accepted. Cell phones and electronic devices are not permitted to be used during class, except on occasions dictated by the instructor (such as using it to time, take video, or do research). Refer to the "Stop Light" at the front of the room for guidance on when using your cell phone is appropriate. When you are in class, I expect to have your undivided

attention as we have *so much to do and so little time!* Electronics will be taken and locked up if they are used appropriately during class. It's your responsibility to remember to collect your device after class. Excessive offenses will require further disciplinary action as stated by the CHS policies.

Academic Dishonesty:

I take dishonesty as a personal insult and will vigorously apply the heaviest penalties I am permitted to any student caught cheating. If you are unsure of the legitimacy of your activities, ASK.

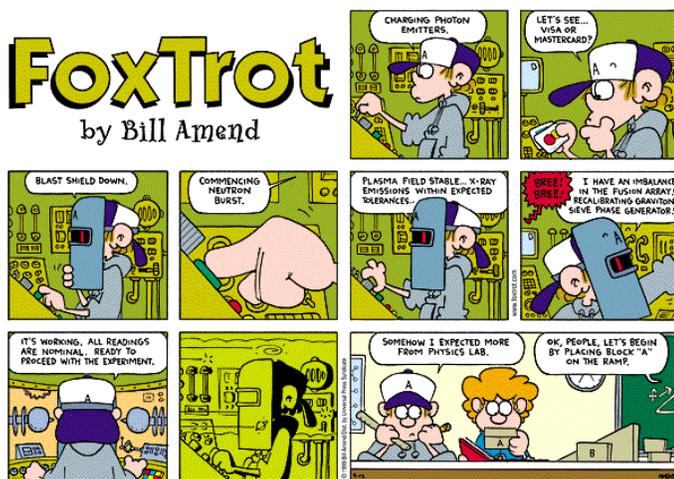


If you think these cartoons are funny, you just might be ready for AP Physics!



FoxTrot

by Bill Amend



Course Topics and Schedule

The big ideas for AP[®] Physics 2 are correlated to the content of the course and to the lab and inquiry-based investigations done throughout the school year. Some anticipated labs and projects are included in the course outline below.

- Big Idea 1: Objects and systems have properties such as mass and charge. Systems may have internal structure.
- Big Idea 2: Fields existing in space can be used to explain interactions.
- Big Idea 3: The interactions of an object with other objects can be described by forces.
- Big Idea 4: Interactions between systems can result in changes in those systems.
- Big Idea 5: Changes that occur as a result of interactions are constrained by conservation laws.
- Big Idea 6: Waves can transfer energy and momentum from one location to another without the permanent transfer of mass and serve as a mathematical model for the description of other phenomena.
- Big Idea 7: The mathematics of probability can be used to describe the behavior of complex systems and to interpret the behavior of quantum mechanical systems.

Because of the extensive amount of material we must master prior to the AP Exam, this course will move at a rapid pace.

"The bus is moving! Fasten your seat belt and get ready for a crazy ride!"

1st SEMESTER

Unit 1	8/12-9/6	<u>Fluid Statics and Dynamics (Chapter 10)</u> Introduction to lab methods, properties of fluids, pressure, Pascal's Principle, Buoyancy, Archimedes's Principle, fluid flow, continuity, Bernoulli's Principle <i>Special Activities: Great Cardboard Boat Race!</i>
Unit 2	9/9 – 10/1	<u>Temperature, Pressure & Gas Laws, and Heat (Chapter 13 & 14)</u> Temperature scales, probability & equilibrium, thermal expansion of solids and liquids, pressure in gases, absolute temperature, ideal gas law, kinetic theory Internal energy, heat, heat capacity, specific heat, phase transitions, thermal conduction, convection, radiation <i>Special Activities: Ice cream & popcorn</i>
Unit 3	10/2 – 10/22	<u>Laws of Thermodynamics (Chapter 15)</u> First, Second, Third, and Zeroth Law of Thermodynamics, thermodynamic processes, heat engines and refrigerators, entropy, PV diagrams
Unit 4	10/23-11/19	<u>Electrostatics (Chapters 16 & 17)</u> Elementary charges, fundamental particles, charging and redistribution of charge, electric forces, Coulomb's Law, electric field, electric potential, equipotential, electric potential energy, capacitors, dipoles
Unit 5	11/20-12/13	<u>Electric Circuits (Chapters 18 & 19)</u> Ohm's Law, resistivity, simple and complex DC circuits, Kirchoff's Laws, Steady-state RC circuits <i>Special Activities: Electric pickle</i>

2nd SEMESTER

Unit 6	1/6-1/31	<u>Magnetism (Chapter 20 & 21)</u> Magnetism, sources of magnetic fields, magnetic forces, charged particles moving in magnetic fields, electromagnetic induction, Faraday's Law, Lenz's Law, AC Circuits, Transformers and practical applications <i>Special Activities: Electric motors; Six Flags Trip in May!</i>
Unit 7	2/3 -3/13	<u>Electromagnetic Waves, Geometric & Physical Optics (Chapters 22, 23, 25, 24)</u> Nature of light and electromagnetism, reflection, mirrors, critical angle, refraction, lenses, optical instruments, total internal reflection Interference, polarization, diffraction, Young's Double Slit Experiment <i>Special Activities: Kaleidoscope, mock Lasik surgery</i>
Unit 8	3/23-4/3	<u>Quantum Physics (Chapter 27 & 28)</u> Theory of photons, Photoelectric Effect, Quantized energy states for electrons in atoms and photons, wave-particle duality, deBroglie Wavelength, electron diffraction, photon momentum, photon particle collisions, wave functions, probability
Unit 9	4/6 -4/24	<u>Nuclear Physics (Chapter 30 & 31)</u> History and development of modern physics, fundamental particles and forces, radioactivity, nuclear reactions, radiation, half-life, mass & energy equivalence <i>Special Activities: Nuclear energy debate</i>
	4/27-5/5	<i>REVIEW FOR AP PHYSICS 2 EXAM (May 2nd, noon)</i>
Unit 10	5/11-5/22	<u>Special Relativity (Chapter 26)</u> Postulates of the Theory of Special Relativity, time dilation, Twin Paradox, length contraction, Michelson-Morley Experiment, relativistic momentum and mass, impact of special relativity

Flagstaff Unified School District

Coconino High School

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To the Parents & Guardians of Advanced Placement Physics Students:

Parental support is one of the most important aspects of student success in any course. I realize that most of my students are taking other advance placement courses and are actively involved in a variety of functions. They are busy, successful young adults completing college level course work thanks to your support and encouragement.

Your student will be taking the Advanced Placement Physics exam given by the College Board on May 6th, 2020. A score of 3, 4, or 5 will possibly earn them college credit. The actual number of credits and their application depend upon the university attended and the score they achieve. Many of today's universities are using AP coursework as a component when evaluating applicants. I highly recommend that students avail themselves of this opportunity. Please call me if you have any questions or concerns regarding this class opportunity.

During my time teaching AP Physics, I've found that there are "Seven Habits" that successful AP students all share. Please review these with your student and use them to help set goals for the new school year so they can have the best possible experience in this and all their courses.

#1: Have a positive attitude - *Be excited! Be motivated! Simply enjoy the experience!*

#2: Be attentive and actively participate in class during discussions - *Ask & answer questions in class. Come to class ready to give 100%. Every second in class is an opportunity to learn!*

#3: Turn in quality work on time - *Every assignment has a purpose. Late work and zeros damage your grade. Make up late work within 3 days of being gone.*

#4: Ask for help when you need it - *Everyone will need help at some point! It's ok! Please see Ms. Sapio's calendar for available times for tutoring. Homework & test corrections help your grade & understanding.*

#5: Strive for deep understanding of the content, not just a grade - *If you understand the material, you WILL succeed in class! Deep content knowledge = deep understanding of the world around you!*

#6: Be fully involved in all labs and projects - *Lab work is where most of the learning takes place – we build equations and understanding from every lab! Complete your lab journal immediately after the lab is done, not the night before it's due. Take time to really pull the physics out of each lab experience and reflect thoughtfully on it. The more effort you put in, the more rewarding this experience will be!*

#7: Study nightly - *Review your notes. Practice problems. Read your text book. Use internet resources*

Please read the attached syllabus thoroughly so you know what my expectations are for your student this year.

Please read the syllabus carefully, complete the "Syllabus Scavenger Hunt" on the back of this page with your student, then sign this letter and have your student return it for points by Wednesday, August 14.

I look forward to the year ahead and the opportunity to work with your student again.

Sincerely,



Christine Sapio
Physics Instructor
Coconino High School
csapio@fUSD1.org
773-8200 x 6493 (W)

I have read through the syllabus for AP Physics and agree to do my part to make this year an exciting and positive experience.

Parent Signature

Student Signature

Student Name: _____ Date: _____

Year in School (circle one): Sophomore Junior Senior

Parent/Guardian Name: _____

Parent/Guardian Cell Phone: _____ Email Address: _____

What grade are you expecting to get in class? _____ Read over the "7 Habits" of highly successful AP Students. Which habits do you feel are a strength for you?

Which habits do you feel you need to work on? Set a goal for yourself involving one of these Habits.

Do you have a job? Where do you work? _____ Hours/week? _____

Long Range Educational Goals: _____

What would you like to do as a profession? _____

What hobbies and interests do you have? _____

What clubs, activities, or sports are you involved in? _____

Anything else you'd like me to know that makes you uniquely you? _____

AP Physics 2 Syllabus Scavenger Hunt

1. You can expect a quiz many weeks on which day of the week? _____
2. What is the extra credit bonus for having your lab write up completed 2 days after the experiment is completed in class? _____
3. How much is the Performance/Masurement category worth toward your final grade? _____
4. How much is the Practice category worth toward your final grade? _____
5. How do you sign up for tutoring or make up work time with Ms. Sapio? _____
6. When is the cut-off for turning in late work for a unit? _____
7. Log on to your StudentVue account and find out:
What day is your Thinking Physics Assignment (from your summer assignments) due? _____
What's the name of your first lab for this semester? _____
How many points is completing this Scavenger Hunt worth? _____
8. Describe the policy for correcting assignments using your Newton Bucks.
9. What other questions or concerns do you and your parents/guardians have about AP Physics?