Course Syllabus

Franklin High School	2020-2021

DIRECTIONS: For each course, complete the syllabus and share with your evaluating/supervising administrator **as a pdf** ("File-download-PDF document") by 9/28/20. Syllabi will be posted on the FHS website under your name for the public to view.

Course Overview

NOTE: For core classes, all elements of this section (except for name and contact information) are the same.

Course Title: AP Physics Part 2	
Instructor Name: David Stroup	Contact Info: dstroup@pps.net
Grade Level(s): 11-12	
Credit Type: (i.e. "science", "elective") sci elective	# of credits per semester: 1
Prerequisites (if applicable): It is assumed that the student will have taken AP Physics Part 1	

General Course Description:

Advanced Placement Physics Part 2 is an algebra-based course in general physics. It is equivalent an introductory algebra-based university-level "E & M" (electricity and magnetism) physics course. This course will (for now) be covered in only one semester, and will start with fluids, proceeding to a more in-depth treatment of E & M, thermodynamics, optics, and modern physics, including nuclear and quantum physics. It is designed specifically to follow AP Physics Part 1. The emphasis in the course is on gaining an understanding of the essential concepts and skills of physics, and using the concepts and formulae to solve problems. Laboratory work will be covered as an integral part of this course.

This is not going to be a normal year. Or a normal AP class. So everything in here is subject to change, depending on what happens with school district plans... and world events. Class "meets" every day, **and attendance will be taken,** with "synchronous" classes some day and "asynchronous" on others (an up-to-date schedule will be on the class Canvas page). While we're doing distance learning, all lessons will be made available "asynchronously" — posted online for you to follow at your own pace. I do **not** plan on "lecturing" during our on-line video sessions. Attendance is mandatory and will be taken by teachers, but if you do miss a class any material will be available online. "Class" time will be for answering questions, demonstrating how to do problems, showing (on-screen or simulated) demos, and generally checking in. Class starts in September and we will have about 17 weeks to cover the material, half the time we normally have — but this will be with a class every day. Because you are only taking four classes this semseter, you are expected to work on this class and make progress in some way every day... it's twice as much work per week for half the time. The AP Physics Part 2 test is currently scheduled for Friday, May 7, at noon. Support will be provided between the end of the first semester and the time of the AP test.

Hopefully, we will be in person the second quarter. In that case we will continue to meet every day, but for more traditional classes — with (we hope) real in-person labs and demos. Fingers crossed!

Students will sign up for an account with the AP College Board and add this class during the first few weeks of school (this will be an in-class activity). You will sign up for the AP test at this time. Registration on the AP website is required, and will be needed to access online resources and workbooks. It is expected tat everyone wil take the AP test. Financial assistance is available to anyone who wants to take the AP test and may have difficulty affording it. If you get a "3" on the AP test, I will raise your grade to a "B." If you get a "4" or "5" I will rise your grade to an "A." For more information about the AP Exam, visit www.apcentral.collegeboard.com

Peer coaching, peer teaching and peer review are an essential part of our course. Students are encouraged from the first day to create or join a study group to work with in and out of class — nobody works in a vacuum. Course goals include developing each student's intuition, creativity, and investigative skills to do the following (abbreviated from the 2014-15 College Board AP Physics Course Description):

- Use representations and models to communicate scientific phenomena and solve scientific problems.
- Use mathematics appropriately.
- Engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.
- Plan and implement data collection strategies in relation to a particular scientific question.
- Perform data analysis and evaluation of evidence.

- Work with scientific explanations and theories.
- Connect and relate knowledge across various scales, concepts, and representations in and across domains.

Prioritized National/State Standards:

Next Generation Science Standards: HS.Forces and Interaction; HS.Energy, including HS-PS3-1 through 5; HS.Waves and Electromagnetic Radiation, including HS-PS4-1 including HS-PS4-1 through HS-PS4-4

As an AP course, the class si based around the standards and learning expectations of the AP curriculum:

Organizing Principals:

What's the Big Idea?

AP Physics is organized around a set of seven "Big Ideas" that we will revisit throughout the class:

Big Idea 1: Objects and systems have properties such as mass and charge.
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

Science Practices:

Science practice 1: The student can use representations and models to communicate scientific phenomena and solve scientific problems.
Science practice 2: The student can use mathematics appropriately.
Science practice 3: The student can engage in scientific questioning to extend thinking or to guide investigations within the context of the AP course.
Science practice 4: The student can plan and implement data collection strategies in relation to a particular scientific question.
Science practice 5: The student can perform data analysis and evaluation of evidence.
Science practice 6: The student can work with scientific explanations and theories.
Science practice 7: The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.

Learning Objectives:

Learning objectives are outlined at the start of each chapter of OpenStax College Physics for AP Courses.

Course Details

Learning Expectations

Materials/Texts

- *College Physics for AP Courses* from OpenStax (https://openstax.org/details/college-physics-ap-courses). Acquire your copy for free online ASAP. This text is officially listed by the AP College Board as a text that meets the Board's curricular requirements (http://www.collegeboard.com/html/apcourseaudit/courses/physics_1_textbook_list.html).
- Scientific Calculator (graphing preferred).
- A composition book (stitched) or similar book to serve as a lab note-book. You may be asked about lab results on a test, in which case that part of the test will be 'open notebook' for this book — so you'd better have it on you.
- Some way of taking and keeping notes separate from the lab notebook.

- A three ring binder WITH DIVIDERS to keep handouts and homework, AP documents, formal lab write-ups, and tests. You will be expected to maintain this jotebook by the instructor *and possibly by your college*, if you want college credit for this course!
- *Physics* by Giancoli, 3rd Ed. (classroom set).

Course Content and Schedule:
Note that specific learning objectives are denoted for each unit.

Syllabus:

UNIT 0. INTRODUCTION AND REVIEW
- Review of basic units and conversions
- Review of measurement, calculation, error
- Newton's Greatest Hits: Review of the basics of Part 1
  - Kinematics
  - Dynamics
  - Momentum
  - Energy

Big Ideas 1, 2, 3, 4, 5

UNIT 1. ELECTROSTATICS [CR2c]
- Electric force
- Electric field
- Electric potential

Big Ideas 1, 2, 3, 4, 5
Learning objectives: 1.B.1.1, 1.B.1.2, 1.B.2.2, 1.B.2.3, 1.B.3.1, 2.C.1.1, 2.C.1.2, 2.C.2.1, 2.C.3.1, 2.C.4.1, 2.C.4.2, 2.C.5.1, 2.C.5.2, 2.C.5.3, 2.E.2.1, 2.E.2.2, 2.E.2.3, 2.E.3.1, 2.E.3.2, 3.A.2.1, 3.A.3.2, 3.A.3.3, 3.A.3.4, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.B.1.3, 3.B.1.4, 3.B.2.1, 3.C.2.1, 3.C.2.2, 3.C.2.3, 3.G.1.2, 3.G.2.1, 3.G.3.1, 4.E.3.1, 4.E.3.2, 4.E.3.3, 4.E.3.4, 4.E.3.5, 5.A.2.1

UNIT 2. ELECTRIC CIRCUITS [CR2d]
- Electric resistance
- Ohm's Law
- DC circuits with resistors only
- Kirchhoff's Laws
- Series, parallel, and series-parallel circuits
- Capacitance
- DC circuits with resistors and capacitors

Big Ideas 1, 4, 5
Learning objectives: 1.E.2.1, 4.E.4.1, 4.E.4.2, 4.E.4.3, 4.E.5.1, 4.E.5.2, 4.E.5.3, 5.B.9.4, 5.B.9.5, 5.B.9.6, 5.B.9.7, 5.B.9.8, 5.C.3.4, 5.C.3.5, 5.C.3.6, 5.C.3.7

UNIT 3. MAGNETISM AND ELECTROMAGNETIC INDUCTION [CR2e]
- Magnetic field
- Magnetic force on a charged particle
- Magnetic force on a current-carrying wire
- Magnetic flux
- Electromagnetic induction: Faraday's Law
- Lenz's Law
- Motional emf

Big Ideas 1, 2, 3, 4
Learning objectives: 2.C.4.1, 2.D.1.1, 2.D.2.1, 2.D.3.1, 2.D.4.1, 3.A.2.1, 3.A.3.2, 3.A.3.3, 3.A.4.1, 3.A.4.2, 3.A.4.3, 3.C.3.1, 3.C.3.2, 4.E.1.1, 4.E.2.1

UNIT 4. THERMODYNAMICs [CR2a]
- Kinetic theory
- Ideal gases
- First law of thermodynamics
- Thermodynamic processes and PV diagrams
- Heat engines

• Carnot cycle
• Efficiency
• Second law of thermodynamics: entropy
Big Ideas 1, 4, 5, 7
Learning objectives: 1.E.3.1, 4.C.3.1, 5.A.2.1, 5.B.4.1, 5.B.4.2, 5.B.5.4, 5.B.5.5, 5.B.5.6, 5.B.6.1, 5.B.7.1, 5.B.7.2, 5.B.7.3, 7.A.1.1, 7.A.1.2, 7.A.2.1, 7.A.2.2, 7.A.3.1, 7.A.3.2, 7.A.3.3, 7.B.1.1, 7.B.2.1

UNIT 5. FLUIDs [CR2b]
• Density
• Pressure: atmospheric and fluid pressure
• Pascal's principle
• Buoyant force
• Archimedes' principle
• Flow rate
• Continuity equation
• Bernoulli's principle
Big Ideas 1, 3, 5
Learning objectives: 1.E.1.1, 1.E.1.2, 3.C.4.1, 3.C.4.2, 5.B.10.1, 5.B.10.2, 5.B.10.3, 5.B.10.4, 5.F.1.1

UNIT 6. GEOMETRIC AND PHYSICAL OPTICs [CR2f]
• Reflection
• Image formation by flat and curved mirrors
• Refraction and Snell's Law
• Image formation by thin lenses
• Interference and diffraction
• Double slit, single slit, and diffraction grating interference
• Thin film interference
Big Idea 6
Learning objectives: 6.A.1.2, 6.A.1.3, 6.A.2.2, 6.B.3.1, 6.C.1.1, 6.C.1.2, 6.C.2.1, 6.C.3.1, 6.C.4.1, 6.E.1.1, 6.E.2.1, 6.E.3.1, 6.E.3.2, 6.E.3.3, 6.E.4.1, 6.E.4.2, 6.E.5.1, 6.E.5.2, 6.F.1.1, 6.F.2.1

UNIT 7. QUANTUM PHYSICS, ATOMIC AND NUCLEAR PHYSICS [CR2g]
• Atoms, atomic mass, mass number, and isotopes • Atomic energy levels
• Absorption and emission spectra
• Models of light: wave and particle
• Photoelectric effect
• DeBroglie wavelength
• Wave function graphs
• Mass-energy equivalence
• Radioactive decay: alpha, beta and gamma decay
• Half life
• Conservation of nucleon number: fission and fusion
Big Ideas 1, 3, 4, 5, 6, 7
Learning objectives: 1.A.2.1, 1.A.4.1, 1.C.4.1, 1.D.1.1, 1.D.3.1, 4.C.4.1, 5.B.8.1, 5.B.11.1, 5.C.1.1, 5.D.1.6, 5.D.1.7, 5.D.2.5, 5.D.2.6, 5.D.3.2, 5.D.3.3, 5.G.1.1, 6.F.3.1, 6.F.4.1, 6.G.1.1, 6.G.2.1, 6.G.2.2, 7.C.1.1, 7.C.2.1, 7.C.3.1, 7.C.4.1

Differentiation/accessibility strategies and supports (TAG, ELL, SpEd, other):

The nature of inquiry labs and the emphasis on writing projects (in the form of science journal articles) are intended to allow students to go beyond the "bare bones" of the class and challenge themselves to come up with their own lab procedures and conduct research outside class. Honors will be available to students who complete additional projects, including an optional video project similar to a science fair project.

All support will be given to students with special needs. Late work and retakes are allowed, and longer projects are structured around organizers and prompts that direct all students in how to break a large project up into "chunks."

Safety issues and requirements (if applicable):

Students observe standard safety precautions and sign a safety form that has been modified with physics-specific safety items, including safety around electrical circuits and lasers.

Classroom norms and expectations:

Behavior & Expectations:

This is a high-intensity course equivalent to college physics. It is important that everyone be on their best behavior. Respect for your classmates is expected at all times; disrespect for your fellow scholars will not be tolerated.

Academic dishonesty will result in an assignment grade of F (ZERO). Plagiarism is considered academic dishonesty: on papers, any material that you copy from a source must be obviously a quote (for example, in quotation marks), and must be attributed. Excessive use of quoted material may be considered plagiarism—only quote primary sources. Copying from another student is also plagiarism. On a test, a pattern of identical wrong answers among people sitting next to each other may be taken as a sign of cheating!

On-line tests: During distance learning, on-line tests are structured with the assumption that you may have the textbook at hand, or a web browser open to look stuff up. The important academic honesty rule is this: **You may not (ever!) communicate with another student about the questions or answers, or copy another student's work!** You will not get simple "definition" questions (like "what is kinetic energy?"), and some questions will require written answers where you must explain your reasoning... this work must be all original! On som questions you may be invited to look things up on the Internet. We call this "research," and it's good — but you must cite your source (name of source and link).

Absences and Late Work: (note that attendance will be taken for distance learning sessions!) As a general rule, due dates are not negotiable, but see the instructor for special cases. If students have an excused absence on a due date, material is due when they return to school. If students are absent for a lab it must be made up before school, lunchtime, or after school by appointment with the teacher within one week of the assigned date. The teacher is under no obligation to accept late work if it is due on a day that the student has an unexcused absence. *It is student's responsibility to obtain assignments for the time that they are absent and to make appointments with the teacher for lab make-up.*

Safety: (we'll still learn about it for when we are able to do "real" labs, this year or if/when you take AP Physics 2.) Since this is a laboratory class, students are expected to adhere to common sense safety rules for their protection as well as the protection of others in the classroom, no running, or using equipment as a toy or weapon. We will use lasers in this class, and their improper use can result in eye damage; unsafe behavior may result in removal from the lab! Respect for lab equipment is imperative, and deliberate mistreatment of lab equipment will also result in exclusion from labs until it is determined that the student can be trusted. The student or group of students responsible for broken equipment will be charged for its replacement.

Tutorials: (during distance learning, tutorial time will be additional video sessions.) Tutorials are part of the school day, and will be used to hold periodic recitation sessions which may be integral to your success in the class. A recitation session in college is a period dedicated to going over material and problems in depth, focusing on problem solving, practicing the material, and responding to student questions. Because of the amount of material covered in AP Physics it may not always be possible to cover all types of problems during the normal class period! It is an expectation of this class that you attend one or more recitation session per unit, and material covered in depth in a recitation session — but mentioned only briefly in class — may appear on tests. You will be informed of dates for recitation sessions for particular material or problem types. (Some tutorials will be used for other classes or periods, or for catch-up work.)

Cell phone policy: (OK, this is almost exclusively a " when we are in person" thing, but...) Call phones and related devices are **not to be used except with the explicit permission of the instructor, and only as a scientific instrument (timer, to take videos of an experiment, etc.)!** If a cell phone is being used inappropriately (which is almost at any time without permission) you will be told to put it away; if you don't, or if the phone comes out again, it will be confiscated, and may be sent to the office (as per school rules). You may be given permission to take out your phones to use in connection with the class; please be familiar with apps such as your scientific calculator, stopwatch, inclinometer (look it up), etc. High-speed video camera apps (240+ fps) are available free, as are lots of other cool tools. **In general, phones or other connected devices will not be permitted as a substitute for a calculator on a test; bring your calculator!**

Evidence of Course Completion

Assessment of Progress and Achievement:

The plan is:

- Tests 45%
- Labs Papers: 45%
- Bi-weekly quizzes, "pop" quizzes (waem-ups and exit tickets), lab hand outs, other projects: 10%

This break-down is approximate, especially during distance learning, when the focus may be more on tests and on-line labs.

Homework will be issued in the form of packets at the start of each unit, and/or assigned online as Formatives (as those resources become available). **During distance learning,** packets will be self-directed; you work on them and we discuss the answers in class. You will then have your completed packets as notes for the tests (which will basically be open notes). Formatives will be worth a small number of points. **In face-to-face learning,** homework be discussed in class and collected, and may be entered in the gradebook for a small number of points. Homework packets include an answer key, so to get credit for having done the homework you must, naturally, show all work. You must be up to date on homework to take advantage of options like re-tests and test corrections. Not up to date? Get up to date!

Tests are at the end of major units. Re-tests are allowed with no penalty, but only if you are up to date on other work! The final will be a longer test with some cumulative content. Tests are basically open textbook and open notes, but see below under Behavior & Expectations for notes on academic honesty and what would be considered cheating under these circumstances!

Lab Papers (these will be more important when we are in person) are major projects, and are considered to be an important summative (test-like) component of the hands-on lab practices part of this class. In other words, you demonstrate that you "get" this part of the class by doing the paper. There will be just four of these papers throughout the year, and they will be in science journal format. The intent will be for you to learn to do college-level work in this format. Don't panic if you don't know this yet! Before your first paper is due we will discuss this extensively, read sample papers, and go over a rubric for the work you are expected to do. We'll learn it together. **If you turn in the paper on time** you will be allowed to revise for points. If you don't get it in in on time you still owe me a paper—see me to make a commitment as to when you will turn it in.

In distance learning, there will be periodic "exit ticket" quizzes and the like; they will be worth points, but not a lot.

In addition to tests and quizzes, **pre-assessments** will be delivered before key units, including the unit on Newton's physics, forces, and gravity.

In addition, **we will be using new on-line resources** (especially periodic self-checks and workbooks) provided by the AP College Board. These resources were just made available to us in August, so we will be rolling out their use as the year goes on.

Progress Reports/Report Cards (what a grade means):

Standard A to D with F.

Career Related Learning Experience (CRLEs) and Essential Skills:

Links with careers in engineering and (of course) the sciences are emphasized throughout. Open-ended inquiry labs include a chance to practice engineering and design. After-the-test projects (if possible this year through the AP Support class) feature design-trouble shoot-test-improve engineering cycles.

Communication with Parent/Guardian

What methods are used to communicate curriculum, successes, concerns, etc.?

E-mail, Remind, phone calls if necessary, and an emphasis on making sure grades are always available quickly in Synergy, and expectations for the week are posted in Canvas.

Personal Statement and other needed info

David Stroup is an experienced teacher with a BS in physics and a career history that include journalism and the corporate world. As a journalist and sometimes science writer, he learned communications skills and the importance of writing, something he brings to his classes in the form of written projects and high expectations for college-level writing. The wide range of his professional experience — from radio to local newspapers to the construction industry — has given him a unique perspective on career activities. As a professional editor in the grant-writing industry, he keeps up with trends in STEM, education, and college opportunities. Mr. Stroup has an M.Ed. in secondary education and has published several books.