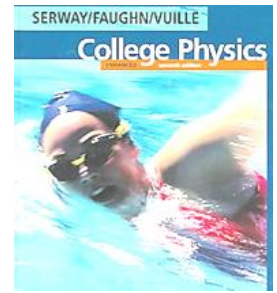




**Mass Academy of Math and Science**  
**Physics Course Info 2020-2021**  
**Physics Teacher: Mr. Ellis**  
**Website: mrellis.com:8000**



## **Academy Physics - Frequently Asked Questions (FAQs)**

### ***Q: What background (subjects, topics) do you need for this course?***

**Science:** Because local school systems prescribe science courses in different sequences there is no specific science background required. It is helpful to have completed a science course with in-depth labs and data analysis.

**Math:** A student must have completed at least through an Algebra 2 course, and have a very thorough and functional understanding of those topics. This course constantly requires manipulating equations with many variables, systems of equations, and graphs (equations, intersection points, slopes, and areas). We will use algebra, trigonometry, radians, logarithms, pre-calculus, and calculus for some students. The required portions of these math topics will be reviewed or introduced in the course.

### ***Q: What if a student has never taken physics, or has already taken physics?***

Physics is the only 11th grade science course offered at the Academy. The average in the past 5 years is that over 80% of the students have not had physics previously. Therefore, the instructional assumption is that students do not have a physics background. The course is designed with differentiated instruction where different students in the class are working on different problems or labs. Students who have taken physics previously are required to take it again but there are numerous opportunities for more challenging problems or other content. There is no statistical significance between having physics previously and high achieving in this course.

### ***Q: Which standardized physics curriculum topics are covered; AP Physics 1 & 2, AP Physics C, SAT Physics?***

This is not an official AP Physics course however the topics covered in-depth are closely aligned with the AP Physics 1 and AP Physics C curriculums. Additional topics such as waves, optics, thermodynamics, and modern physics are covered at a depth appropriate for the SAT Physics. See the Comparison of Physics Content Areas table (on back).

### ***Q: What makes this course different than physics courses in most other high schools?***

**Math:** The mathematical rigor in this course is greater than typical honors or accelerated physics courses. The math used daily is equivalent to an AP Physics 1 & 2 course on most topics, and AP Physics C for some students and topics.

**Labs and Technology:** Most labs are student-designed and built. Students determine what to use for variables, equipment, data ranges, and how to best minimize experimental error. The lab reports require in-depth analysis using extensive presentation formatting in MS Excel, Word, PowerPoint, large posters, and other media. Technology projects include Uber Problems, and dynamic models in Excel and CS programming languages.

### ***Q: Which textbook is used for this course?***

The textbook connected with this course is College Physics by Serway and Faughn, 7th ed (see picture at top), and copies are available for all students for the junior year. The content of the course, however, does not follow the order in the book. We generally use custom notes, worksheets, and assessments. The textbook can be a good resource for supplemental information, practice problems, and computer-based interactive applets.

### Academy Physics Description:

Academy Physics uses mathematical and experimental approaches to investigate, learn, and model connections between physics concepts, equations, and graphs. The learning is reinforced with classroom discussions and collaborative work and includes topics on the AP Physics 1 and AP Physics C exams, as well as waves, optics, thermodynamics, and modern physics. With guided supervision and a focus on good problem solving, students are required to design and build their own labs. Students analyze their data using statistical methods and report findings with magazine-formatted printouts, poster boards, and PowerPoint presentations.

In a typical class we go over HW in groups, HW notes and new content, Q&A, and practice CW/HW. In a typical lab students get a topic, design experiment, refine experiment, collect data, analyze data, and report.

### Comparison of Physics Content Areas for Commons Curriculums and/or Standardized Tests (as of Aug 2020):

Physics Content Area	MCAS Physics	SAT Physics	AP Physics 1	AP Physics 2	AP Physics C	Academy Physics
<b>I. Newtonian Mechanics</b>		40%			50%	60%
A. Kinematics	✓	✓	✓		✓	✓
B. Newton's laws of motion, Dynamics	✓	✓	✓		✓	✓
C. Work, energy, power	✓	✓	✓		✓	✓
D. Linear momentum	✓	✓	✓		✓	✓
E. Circular motion	✓	✓	✓		✓	✓
F. Gravitation	✓	✓	✓		✓	✓
G. Torque		✓	✓		✓	✓
H. Oscillations (SHM)		✓	✓		✓	✓
<b>II. Electricity and Magnetism</b>		24%			50%	20%
I. Electrostatics	✓	✓	✓	✓	✓	✓
J. Electric circuits (V, I, R)	✓	✓	✓	✓	✓	✓
K. Magnetic fields	✓	✓		✓	✓	✓
L. Electromagnetism	✓	✓		✓	✓	✓
M. Capacitors (+Inductors AP-C)		✓		✓	✓	✓
<b>III. Waves and Optics</b>		16%				10%
N. Waves, Sound, Doppler	✓	✓	✓			✓
O. Physical optics		✓		✓		+
P. Geometric optics		✓		✓		+
<b>IV. Thermal and Fluid Physics</b>		10%				5%
Q. Temperature and heat	✓	✓		✓		+
R. Kinetic theory and thermodynamics	✓	✓		✓		+
S. Fluid mechanics				✓		
<b>V. Modern Physics</b>		10%				5%
T. Atomic physics		✓		✓		+
U. Quantum effects		✓		✓		+
V. Nuclear physics and relativity		✓		✓		+

- The percentages, where available, indicate the average time spent or emphasis on major topics
- The checkmarks indicate which sub-topics are covered on each test but not depth of the content
- The Academy Physics topics are generally covered at a depth aligned with AP Physics 1 & 2 and AP Physics C
- The +'s in the Academy column indicate topics covered at a depth for SAT Physics not AP Physics