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# PETERS TOWNSHIP HIGH SCHOOL

## COURSE SYLLABUS: AP PHYSICS I: ALGEBRA-BASED

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### Course Overview and Essential Skills

AP Physics I: Algebra-based is a first year algebra-based physics course which focuses on the big ideas typically included in a first semester, algebra-based, introductory college-level physics course. Students are expected to be enrolled in pre-calculus and have a working knowledge of trigonometry. This course is designed for the college bound student planning a career in science, medicine, or engineering or any highly motivated student with a desire to learn about the physical world as this course provides students with enduring understandings to support future advanced coursework in the sciences. Students are encouraged to take the AP Physics I: Algebra-Based exam. Using an inquiry-based approach, students will develop critical thinking, reasoning and problem solving skills. The course is based on six Big Ideas, which include core scientific principles, theories, and processes and will provide students with a broad way of thinking about the physical world. Students will be encouraged to develop connections across topics, disciplines and with the real world. Content knowledge and reasoning skills are equally important in this course. This course requires that a minimum of 25% of course time is devoted to lab work with an emphasis on inquiry-based experiences which provide opportunities for students to investigate the foundational physics principles while demonstrating best science practices. Students will conduct investigations in which they ask questions, make observations and predictions, design experiments, collect and analyze data and construct arguments in a collaborative setting where they are expected to direct and monitor their progress. ***This course strongly emphasizes critical thinking and conceptual understanding of physical principles. Students are expected to analyze physical situations in writing, with diagrams, equations and graphs.***

### Course Textbook and Required Materials

- Textbook: *College Physics, AP Edition, 11th Edition*; Serway and Vuille; Cengage Learning; 2018  
ISBN #9781337735339
- Textbook companion site: <https://www.webassign.net>
- Lab notebook, class notebook, writing utensils, graphing calculator, ruler and protractor
- Edmodo.com

### Course Outline of Material Covered:

Unit or Topic	Concepts/Skills/Resources <b>*Note - Each unit includes HW, in-class activities, and quizzes as appropriate</b>	Timeframe
Kinematics (includes the first week of introduction to physics)	Nature of physics; Unit analysis and graphing; Techniques of error analysis; Representations of constant and accelerated motion using diagrams, words, graphs and mathematical manipulations; Equations of uniformly accelerated motion; Horizontal motion, Free fall; Vectors vs. Scalars; Strategies for Manipulating Vectors and Projectile motion Constant vs. Accelerated Motion Lab; Motion Graphing Lab; First Day on the Job; Confirming Galileo Lab; Jumping on the Moon; PTHS Treasure Hunt; Shoot for the Stars Lab; Motion Graphing Test; 1- D Motion Exam; 2 - D Motion Exam	6 weeks
Dynamics	Nature and types of forces; Newton's Three Laws of Motion; Free body and/or force diagrams; Applications of Newton's Second Law	4 weeks

	Inertial balance lab; Third Law Mini-lab; Second Law lab; Friction lab; Grinch Physics Exam; Newton's Laws Exam	
Circular Motion and Gravity	Law of Universal Gravitation; Circular motion; Satellite motion Law of Universal Gravitation Investigation; Solar System Virtual lab; Circular motion lab; Gravity, satellites and circular motion exam	3 weeks
Energy	Work done by constant and variable forces; Energy – its forms and changes; Law of Conservation of Energy Work and power lab; Hooke's law lab; Jumping bug lab; Conservation of Energy lab; Work, power and energy exam	4 weeks
Momentum	Impulse; Linear momentum in one and two dimensions; Types of collisions; Law of Conservation of Linear Momentum Egg drop; COR(bouncy balls) lab; Conservation of Momentum labs; Impulse and Momentum exam	3weeks
Torque and Rotational Motion	Torque and equilibrium; Rotational kinematics; Moment of inertia; Torque and Newton's Second Law for Rotation; Angular Momentum and its conservation Unknown mass lab; Yo-yo lab; Rotational apparatus (dynamics) lab; Fidget spinners lab; Rotational Motion exam	4 weeks
Oscillatory Motion	Characteristics of SHM; Mass-spring systems; Pendulum motion Mass-spring lab; Pendulum lab; Simple harmonic motion FRQ; Simple harmonic motion exam	2 weeks
Waves and Sound	Types and characteristics of waves; Wave properties and interactions; Nature and behavior of sound waves; Standing waves; Mechanical waves lab; Wave properties mini-lab; Speed of sound lab; Standing waves lab; Waves and sound exam	2 weeks
Electric Charge and Electric Force	Nature of charge; Conductors and insulators; Electric forces and fields; Coulomb's Law Exploring electric charges activities; Electrostatics FRQ	1 week
DC Circuits	Parts of a circuit; Current, voltage and resistance; Series, parallel and series-parallel direct current circuits Intro to circuits lab; Various circuits labs; Practical circuits activity; Current electricity exam	3 weeks
AP Exam Preparation	Practice MC and FR questions; Mock exam; topics review activities	2 weeks
Special Topics in Physics	Following the exam students will complete the Roller Coaster Project; investigate additional topics relating to circuits and finally complete the year with lab-based studies of light. Opportunities may be available for student-directed investigations.	5 weeks

***\*Depending on the needs of the class or changes in the school year, the course outline is subject to change.***