



***Department of Teaching & Learning***  
***Parent/Student Course Information***

***Advanced Placement Physics C: Mechanics***  
***(SC 4541)***

***One credit, one year***

***Grades 11-12***

*Counselors are available to assist parents and students with course selections and career planning. Parents may arrange to meet with the counselor by calling the school's guidance department.*

**COURSE DESCRIPTION**

Advanced Placement Physics C: Mechanics is a calculus-based college-level course that examines the principles of physics in detail. This course is designed in accord with the requirements of the College Board. Students are expected to take the appropriate Advanced Placement Physics C Examination at the end of the course.

**COURSE GOALS**

- Develop an in-depth understanding of the concepts, principles and processes of physics and applying these principles in the solution of problems
- Develop an understanding of the means by which information about physics is collected, how it is recorded and interpreted, how hypotheses are formulated from available data and how further predictions are made
- Develop the ability to think clearly and to express ideas orally and in writing with clarity and logic
- Engage in science practices, such as asking investigative questions, designing experiments, analyzing data and constructing arguments
- Develop an understanding that science is a human endeavor with social consequences

**PREREQUISITE**

Algebra II/Trigonometry and Calculus

**OPTIONS FOR NEXT COURSE**

Advanced Placement Environmental Science (Biology and Chemistry prerequisite)

Advanced Placement Biology (Biology and Chemistry prerequisite)

Advanced Placement Chemistry (Chemistry prerequisite)

Oceanography (Earth Science prerequisite)

**REQUIRED TEXTBOOK**

*Physics for Scientists and Engineers, 9<sup>th</sup> Edition, Cengage (2014)*

**MINIMUM REQUIREMENTS**

- Demonstrate knowledge and understanding of all core objectives through laboratory investigations, projects, oral and/or written tests, quizzes and reports
- Read and study assigned chapters in the textbook
- Participate in the laboratory activities, prepare written laboratory reports and adhere to all safety procedures
- Read science journals, magazines and books to expand the ideas and topics presented in class

## The Knowledge, Skills and Attitudes that Comprise the Advanced Placement Physics C: Mechanics Course are Summarized as Follows From the Prescribed Curriculum:

### COURSE TOPICS

- Kinematics (including vectors, vector algebra, components of vectors, coordinate systems, displacement, velocity and acceleration)
  - Motion in one dimension
  - Motion in two dimensions, including projective motion
- Newton's laws of motion
  - Static equilibrium (first law)
  - Dynamics of a single particle (second law)
  - Systems of two or more objects (third law)
- Work, energy and power
  - Work and work-energy theorem
  - Forces and potential energy
  - Conservation of energy
  - Power
- Systems of particles and linear momentum
  - Center of mass
  - Impulse and momentum
  - Conservation of linear momentum, collisions
- Circular motion and rotation
  - Uniform circular motion
  - Torque and rotational statics
  - Rotational kinematics and dynamics
  - Angular momentum and its conservation
- Oscillations and gravitations
  - Simple harmonic motion (dynamics and energy relationships)
  - Mass on a spring
  - Pendulum and other oscillations
  - Newton's law of gravity
  - Orbits of planets and satellites
    - Circular
    - General

### LABORATORY EXPERIENCES

A minimum of twenty percent (20%) of a student's time should be spent conducting hands-on laboratory work. Great emphasis is placed on inquiry-based investigations that provide students with rich opportunities to apply the science practices. The objectives for laboratory and experimental simulations are:

- Design experiments
- Observe and measure real phenomena
- Organize, display and critically analyze data
- Analyze sources of error and determine uncertainties in measurement
- Draw inferences from observations and data
- Communicate results, including suggested ways to improve experiments and proposed questions for further study

## **SCIENCE PRACTICES**

Students will focus on these disciplinary practices in a rigorous and engaging environment. Students will use evidence to develop and revise explanations and predictions of natural phenomena. Such practices require that students:

- 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

**NOTE:** Students should keep a record of their laboratory work so they will be in a position to validate their AP Physics C: Mechanics course as equivalent to the corresponding college course. Most college placement policies presume that students have had laboratory experience.

Dr. Aaron C. Spence, Superintendent  
Virginia Beach City Public Schools  
2512 George Mason Drive, Virginia Beach, VA 23456-0038

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For further information please call (757) 263-1070.

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(Revised August 2017)