

## AP Physics 2 Course and Exam Description

### AP Physics Program

The AP Program offers four physics courses:

AP Physics 1: Algebra-Based is a full-year course that is the equivalent of a first-semester introductory college course in algebra-based physics.

AP Physics 2: Algebra-Based is a full-year course, equivalent to a second-semester introductory college course in physics.

AP Physics C: Mechanics is a half-year course equivalent to a semester-long, introductory calculus-based college course.

AP Physics C: Electricity and Magnetism, a half-year course following Physics C: Mechanics, is equivalent to a semester-long, introductory calculus-based college course

### AP Physics 2 Course Overview

AP Physics 2 is an algebra-based, introductory college-level physics course. Students cultivate their understanding of physics through inquiry-based investigations as they explore these topics: fluids; thermodynamics; electrical force, field, and potential; electric circuits; magnetism and electromagnetic induction; geometric and physical optics; and quantum, atomic, and nuclear physics.

### PREREQUISITES

Students should have completed AP Physics 1 or a comparable introductory physics course and should have taken or be concurrently taking pre-calculus or an equivalent course.

### LABORATORY REQUIREMENT

This course requires that 25% of instructional time be spent in hands-on laboratory work, with an emphasis on inquiry-based investigations that provide students with opportunities to demonstrate the foundational physics principles and apply the science practices.

### AP Physics 2 Course and Exam Content

#### AP Physics 2 Course Content

The course content is organized into seven commonly taught units, which have been arranged in the following suggested, logical sequence:

- Unit 1: Fluids
- Unit 2: Thermodynamics
- Unit 3: Electric Force, Field, and Potential
- Unit 4: Electric Circuits
- Unit 5: Magnetism and Electromagnetic Induction
- Unit 6: Geometric and Physical Optics
- Unit 7: Quantum, Atomic, and Nuclear Physics

## Big Ideas

Systems: Objects and systems have properties such as mass and charge.

- Fields: Fields existing in space can be used to explain interactions.
- Force Interactions: The interactions of an object with other objects can be described by forces.
- Change: Interactions between systems can result in changes in those systems.
- Conservation: Changes that occur as a result of interactions are constrained by conservation laws.
- Waves: Waves can transfer energy and momentum from one location to another without the permanent transfer of mass.
- Probability: The mathematics of probability can be used to describe the behavior of complex systems.

## AP Physics 2 Science Practices

The following science practices describe what skills students should develop during the course:

- Modeling: Use representations and models to communicate scientific phenomena and solve scientific problems.
- Mathematical Routines: Use mathematics appropriately.
- Scientific Questioning: Engage in scientific questioning to extend thinking or guide investigations.
- Experimental Methods: Plan and implement data collection strategies in relation to a particular scientific question.
- Data Analysis: Perform data analysis and evaluation of evidence.
- Argumentation: Work with scientific explanations and theories.
- Making Connections: Connect and relate knowledge across various scales, concepts, and representations in and across domains.

AP Physics 2 course and exam
<b>UNIT 1 FLUIDS</b>
1.1 Fluid Systems
1.2 Density
1.3 Fluids: Pressure and Forces
1.4 Fluids and Free-Body Diagrams
1.5 Buoyancy

1.6	Conservation of Energy in Fluid Flow
1.7	Conservation of Mass Flow Rate in Fluids
<b>UNIT 2 THERMODYNAMICS</b>	
2.1	Thermodynamic Systems
2.2	Pressure, Thermal Equilibrium, and the Ideal Gas Law
2.3	Thermodynamics and Forces
2.4	Thermodynamics and Free-Body Diagrams
2.5	Thermodynamics and Contact Forces
2.6	Heat and Energy Transfer
2.7	Internal Energy and Energy Transfer
2.8	Thermodynamics and Elastic Collisions: Conservation of Momentum
2.9	Thermodynamics and Inelastic Collisions: Conservation of Momentum
2.10	Thermal Conductivity
2.11	Probability, Thermal Equilibrium, and Entropy
<b>UNIT 3 ELECTRIC FORCE, FIELD, AND POTENTIAL</b>	
3.1	Electric Systems
3.2	Electric Charge
3.3	Conservation of Electric Charge
3.4	Charge Distribution-Friction, Conduction, and Induction
3.5	Electric Permittivity
3.6	Introduction to Electric Forces

3.7	Electric Forces and Free-Body Diagrams
3.8	Describing Electric Force
3.9	Gravitational and Electromagnetic Forces
3.10	Vector and Scalar Fields
3.11	Electric Charges and Fields
3.12	Isolines and Electric Fields
3.13	Conservation of Electric Energy
<b>UNIT 4 ELECTRIC CIRCUITS</b>	
4.1	Definition and Conservation of Electric Charge
4.2	Resistivity and Resistance
4.3	Resistance and Capacitance
4.4	Kirchhoff's Loop Rule
4.5	Kirchhoff's Junction Rule and the Conservation of Electric Charge
<b>UNIT 5 MAGNETISM AND ELECTROMAGNETIC INDUCTION</b>	
5.1	Magnetic Systems
5.2	Magnetic Permeability and Magnetic Dipole Moment
5.3	Vector and Scalar Fields
5.4	Monopole and Dipole Fields
5.5	Magnetic Fields and Forces
5.6	Magnetics Forces

5.7	Forces Review
5.8	Magnetic Flux
<b>UNIT 6 GEOMETRIC AND PHYSICAL OPTICS</b>	
6.1	Waves
6.2	Electromagnetic Waves
6.3	Periodic Waves
6.4	Refraction, Reflection, and Absorption
6.5	Images from Lenses and Mirrors
6.6	Interference and Diffraction
<b>UNIT 7</b>	
7.1	Systems and Fundamental Forces
7.2	Radioactive Decay
7.3	Energy in Modern Physics (Energy in Radioactive Decay and $E=mc^2$ )
7.4	Mass-Energy Equivalence
7.5	Properties of Waves
7.6	Photoelectric Effect
7.7	Wave Functions and Probability

## **AP Physics 2 EXAM: 3 Hours**

The AP Physics 2 Exam assesses student application of the science practices and understanding of the course learning objectives outlined in the course framework. The exam is 3 hours long and includes 50 multiple-choice questions and 4 free-response questions.

### **Další informace:**

Ve školním roce 2023\_24 jsou plánovány úpravy obsahu kurzu a zkoušek AP Physics 1 a AP Physics 2, které se projeví v AP zkouškách v květnu 2024. Plánované úpravy najdete zde:

<https://apcentral.collegeboard.org/pdf/ap-physics-1-course-and-exam-description.pdf?course=ap-physics-1-algebra-based>

### **AP Physics 2 Course Overview – 2 stránky**

<https://apcentral.collegeboard.org/pdf/ap-physics-2-course-overview.pdf?course=ap-physics-2-algebra-based>

### **AP Physics 2 Course at a glance – 3 strany**

<https://apcentral.collegeboard.org/pdf/ap-physics-2-course-a-glance.pdf?course=ap-physics-2-algebra-based>

### **AP Physics 1 Course and Exam Description – 246 stran**

<https://apcentral.collegeboard.org/pdf/ap-physics-2-course-and-exam-description.pdf?course=ap-physics-2-algebra-based>

### **Příklady zkouškových otázek**

<https://apcentral.collegeboard.org/pdf/ap21-frq-physics-2.pdf?course=ap-physics-2-algebra-based>

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