

# SAT Physics

**Instructor: Dr. Kai Cai (蔡锴)**

## Who should take this course?

High school students who are taking physics this semester or have taken a year of physics class; had at least a year of algebra, geometry, and pre-calculus (including trigonometry); and plan to take SAT Physics Subject Test (or AP Physics 1 exam) within the current school year.

## What does this course do?

The primary objectives of this course are:

1. To help students develop a conceptual and mathematical understanding of the physics principles, including classical mechanics, electricity and magnetism, waves and optics, thermodynamics, and modern physics.
2. To apply these principles to analyze and solve problems.
3. To better prepare students for the physics class in high school, SAT Physics test, and/or the AP Physics 1 exam.

In most high schools in US, the physics course typically only lasts one year. That is not enough time to cover all the subjects needed, in sufficient depth. So spending more time studying physical concepts and practicing problem-solving skills are going to be very helpful. Physics is an important "fundamental science", which means it forms the basis for many other branches of natural science like chemistry and biology. In addition, many practical applications like engineering and computer-related technology require extensive knowledge of physics. Unlike the High-school Physics class starting at 2pm in NCLS, in this class we pay special attention to the problem-solving skills and test-taking strategies.

**Textbook:** *College Physics*, 10th edition by Serway & Vuille (ISBN: 9781285737027) (recommended)

Reference books:

OpenStax College Physics (available online at [openstax.org/details/college-physics](https://openstax.org/details/college-physics))

Cracking the AP Physics 1 Exam, 2016 or 2017 Edition, Princeton Review

Fall 2017 tentative schedule (subject to adjustments):

Week 2 (September 17)	Chapter 2: 1D Kinematics
Week 3	Chapter 3: Vectors & 2D Motion
Week 4	Chapter 4: Newton's Laws of Motion
Week 5	Continue Chapter 4 – Friction; §7.4: circular motion
Week 6	Chapter 5: Work and Energy
Week 7	Chapter 6: Momentum and Collisions
Week 8	Chapter 7 – Gravitation
Week 9	Chapter 8: Rotational Equilibrium
Week 10	Chapter 13: Simple Harmonic Motion
Week 11	Chapter 9: Solids and Fluids
Week 12	Thanksgiving (no class)
Week 13	Chapter 10: Thermal Physics I
Week 14	Chapter 11: Thermal Physics II
Week 15	Chapter 12: Laws of Thermodynamics
Week 16	<b>Final Exam</b>

**Note: the instructor reserves the right to update or adjust this syllabus at any time.**

Spring 2018 schedule:

Week 1	Chapter 15: Static Electricity I
Week 2	Chapter 16: Static Electricity II; Capacitance
Week 3	Chapter 17: Current, Resistance, Ohm's law, Electric energy and power
Week 4	Chapter 18: Circuits (skip §18.4, 18.5 and 18.8)
Week 5	Chapter 19: Magnetism
Week 6	Chapter 20: Electromagnetic Induction
Week 7	Midterm
Week 8	§13.7 – 13.9 and Chapter 14: Waves and Sound
Week 9	Chapter 21: Electromagnetic Waves
Week 10	Chapter 22: Geometric Optics I
Week 11	Chapter 23: Geometric Optics II
Week 12	Chapter 24: Wave Optics
Week 13	Chapter 26: Relativity
Week 14	Chapter 27: Quantum Physics
Week 15	Chapter 28 – 29: Atomic and Nuclear Physics
Week 16	<b>Final Exam</b>