AP Physics C: Mechanics

Ivy Collegiate School

2020-2021

Department:	Science	**Time:**	MTuW 1:00 – 2:00
Email:	science@ivycollegiateschool.org	**Place:**	806 (Science Lab)

Course References: This is a list of various interesting and useful books and online resources that were used in the construction of the course. You are only required to purchase the first text in the list. (Note: They are available in the restricted library.)

- Randall D. Knight, *Physics for Scientists and Engineers*, Pearson, 4th ed., 2016. REQUIRED.
- Richard Feynman,Matthew Sands, and Robert B. Leighton, *The Feynman Lectures on Physics, Vol. 1: Mainly Mechanics, Radiation, and Heat*, Addison-Wesley, 2nd ed., 2005.
- Robert A. Pelcovits, *Barron's AP Physics C*, Barrons Educational Series, 5th ed., 2020.
- Eugene Hecht, *Schaum's Outline of College Physics*, McGraw-Hill, 12th ed., 2018.
- *PhET Interactive Simulations*, University of Colorado at Boulder, (online resource), https://phet.colorado.edu/

Objectives: This course ordinarily forms the first part of the college sequence that serves as the foundation in physics for students majoring in the physical sciences or engineering. The sequence is parallel to or preceded by mathematics courses that include calculus. Methods of calculus are used wherever appropriate in formulating physical principles and in applying them to physical problems. Strong emphasis is placed on solving a variety of challenging problems, some requiring calculus. The subject matter of the AP Physics C: Mechanics course is classical mechanics and includes topics in kinematics; Newton's laws of motion, work, energy and power; systems of particles and linear momentum; circular motion and rotation; oscillations; and gravitation.

This course is recommended to students with an interest in math and/or the physical sciences and requires a more rigorous approach to solving problems using math. Students will become well-versed in new methods of applying the language of math to the physical phenomena of our macroscopic world. They will look for symmetry in both their physical understanding of the world around them and in the mathematics on the paper before them.

Co-/Prerequisites: Students are required to have completed or be enrolled in one of the following courses: AP Calculus AB or AP Calculus BC.

Notes on AP courses: AP courses culminate in an examination May with scores ranging from 1 to 5 (5 - Extremely well-qualified; 4 - Well-qualified; 3 - Qualified; 2 - Somewhat qualified; 1 - Not qualified). Students are expected to devote additional time beyond their normal class and homework hours to preparing for this examination. While time for instructor-led review is always allotted during the Spring semester, it is important that students begin their review independently and early. At ICS, AP courses have an additional component in the requirement of the completion of a Capstone Project at the end of the year (in lieu of a traditional Final Examination). More details regarding the Capstone Project(s) may be found below.

AP Physics C: Mechanics Course Outline:

Week One	Modelling motion
Week Two	1D kinematics
Week Three	Vectors and coordinate systems
Week Four	2D kinematics
Week Five	Newton's Laws
Week Six	Force and motion
Week Seven	REVIEW WEEK
Week Eight	Introduction to dynamics
Week Nine	Further topics with Newton's 3rd Law
Week Ten	Dynamics in a plane
Week Eleven	REVIEW WEEK
Week Twelve	Work and KE
Week Thirteen	Interactions and U
Week Fourteen	Conservation of momentum
Week Fifteen	Rotation of rigid bodies
Week Sixteen	Gravitation
Week Seventeen	Fluid dynamics and elasticity
Week Eighteen	Oscillations
Week Nineteen	Waves
Week Twenty-Thirty-two	SPRING REVIEW PERIOD
Week Thirty-three-Thirty-seven	CAPSTONE RESEARCH
Week Thirty-eight	CAPSTONE PRESENTATIONS

Grading Policy: Homework and quizzes (60%), Finals and Project (40%)

Capstone Project: The Capstone projects are designed to give you the opportunity to showcase (beyond the examination) what you have learned and the skills you have mastered as part of the course. While every project assignment may be different in scope, target, grading, and type of organization, each is intended to require you to "dig deep" and impress us with your creativity. For this course, you are required to submit an original research paper related to a topic you have learned in class, produce a 30-minute video tutorial on a select topic, or develop a programming project related to a concept from the course. Rubrics will be available in the Spring semester.

Important Dates:

Final Examination	Dec 21, 2020
AP Examination	May 3, 2021
Capstone Deadline	TBD

Course Policy:

- A TI-NSpire CX-CAS is recommended.

Class Policy:

- Regular attendance is essential and expected.

- All assignments should be submitted with complete worked-out solutions.

Academic Honesty: Students are expected to abide by the policies regarding Academic Honesty as laid out in the ICS Student Handbook. Any violations will be forwarded for administrative review and the possible imposition of academic penalties.