AP Physics C Mechanics

Textbook

Halliday, Resnick, Walker. *Fundamentals of Physics 9th ed*. John Wiley and sons.

Course Description

AP Physics is the equivalent of an introductory-level college course. It is very demanding of a student's time and intellect. The emphasis on theoretical topics, critical thinking and problem solving makes this class challenging. Mathematics is used to illuminate physical situations rather than to show off a student's manipulative abilities. Students must be strong in both math and science to be successful in this course.

AP Physics C Mechanics is a semester long, calculus-based course. The class meets five days a week for 55 minutes per class. Although fewer topics are covered in Physics C than in Physics B, they are covered in greater depth in Physics C, and with greater analytical and mathematical sophistication including differential and integral calculus. It is strongly recommended that AP Calculus BC be completed (with an A or B) prior to enrollment in AP Physics C. However, concurrent enrollment in BC Calculus is acceptable.

C8 - Evidence of Curricular Requirement: Introductory differential and integral calculus is used throughout the course

Evaluation

Category	Percent
Homework	10%
Lab	35%
Tests	35%
Mid Term	20%

Course Strategies

Students work in the lab and on assignments in 2-4 person groups. They design and perform labs that allow discovery of the graphical and mathematical models they use throughout the course. Group members make oral presentations before the whole class illuminating and defending experimental findings and conclusions. The emphasis is on the general understanding of the principles involved and how problems are solved rather than on the answer. This approach requires students to be actively engaged in their own learning

Students, working in 2-4 person groups, prepare and present class work and homework problems on whiteboards. Whiteboarding is an active learning process in which the teacher's role is to probe student understanding of the material being presented and to construct strategies to bring the students to a more complete comprehension of this material. Fellow students are encouraged to participate in the whiteboard discussions, but it is a teacher directed process. In addition to the benefits of the teacher guiding the learning process as it takes place, whiteboarding allows students to clarify and define their understanding through verbalization.

C7 - Evidence of Curricular Requirement: The course utilizes guided inquiry and student-centered learning to foster the development of critical thinking skills.

C9 - Evidence of Curricular Requirement: The course includes a laboratory component

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Course Outline

II.	MECHANICS	Chapters	
A.	Kinematics (including vectors, vector algebra, components of vectors, coordinate systems, displacement, velocity and acceleration) 1. Motion in one dimension 2. Motion in two dimensions (Projectile motion)		**C1** - Evidence of Curricular Requirement: Kinematics
B.	Newton's laws of motion (including friction and centripetal force) 1. Static equilibrium (1st law) 2. Dynamics of a single particle (2nd law) 3. Systems of two or more bodies (3rd law)		**C2** - Evidence of Curricular Requirement: Newton's Laws of Motion
C.	Work, energy, power 1. Work and work-energy theorem 2. Conservative forces and potential energy 3. Conservation of energy 4. Power		**C3** - Evidence of Curricular Requirement: Work, Energy and Power
D.	Systems of particles, linear momentum 1. Center of Mass 2. Impulse and momentum 3. Conservation of linear momentum, collisions		**C4** - Evidence of Curricular Requirement: Systems of particles and linear momentum
E.	Circular Motion & Rotation 1. Uniform circular motion 2. Torque and rotational statics 3. Rotational kinematics and dynamics 4. Angular momentum and its conservation		**C5** - Evidence of Curricular Requirement: Circular motion and rotation
F.	Oscillations and gravitation 1. Simple harmonic motion (dynamics and energy relationships) 2. Mass on a spring 3. Pendulum and other oscillations 4. Newton's law of gravity 5. Orbits of planets and satellites		**C6** - Evidence of Curricular Requirement: Oscillations and gravitation

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Laboratory

Labs are an integral component of this class. On average, students spend one day a week performing and analyzing lab activities. Students work in the lab in 2-4 person groups. They design and perform labs that allow discovery of the graphical and mathematical models they use throughout the course. Group members make oral presentations before the whole class illuminating and defending experimental findings and conclusions. Students are required to keep a record of all lab activities and conclusions in a digital portfolio.	**C9** - Evidence of Curricular Requirement: The course includes a laboratory component comparable to a semester long, college-level physics laboratory. Students spend a minimum of 20 percent instructional time engaged in laboratory work. A hands-on laboratory component is required. Each student should complete a lab notebook or portfolio of lab reports.
MECHANICS LABS Constant acceleration Gravitational force Modified Atwood's Machine (Newton's 2nd) Frictional Force Projectile Motion (2-D) Centripetal Force Hooke's Law Energy Transfer Momentum & Impulse Torque Rotary Motion Simple Harmonic Motion	