AP® Physics C Mechanics
Syllabus 2

Lecture–Discussion: Monday, Wednesday,and Friday. 50 minutes each. Two-hour labs: Tuesdays

Text

Physics, Resnick, Halliday, and Krane; 4th ed. New York: John Wiley Vols. I and 2

The AP® Physics C is a national calculus-based [C8] course in physics. The syllabus for this course is designed by the College Board. This course is equivalent to the pre-engineering introductory physics course for the university students. The emphasis is on understanding of the concepts and skills and using the concepts and formulae to solve problems. Laboratory work is an integral part of this course.

C8—Introductory differential and integral calculus is used throughout the course.

Final Grade

Final grade will be determined from the combination of the following scores.

Quizzes	40%
Homework	20%
Lab	20%
Final Exam	20%

Mechanics Labs

There is a two-hour lab every week. The lab report will be graded on the student's participation in the actual experiment and the written report.

Students must save all the graded lab reports. They will be required to present the lab reports as a proof of having done these labs when they seek credit for this course in college. [C9]

C9—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. Note: Online course providers utilizing virtual labs(simulations rather than hands-on) should submit their laboratory materialsfor the audit. If these lab materials are determined to develop the skills and learning objectives of hands-on labs, then courses that use these labs may receive authorization to use the "AP" designation. Online science courses authorized to use the "AP" designation will be posted on the AP Central Web® site.

At least 10 of the following lab experiments will be performed.

1. Indirect measurement of inaccessible heights and distances
2. Areas, volumes, and densities of given solids and liquids
3. Prediction and reproduction of kinematics graphs with motion detector
4. Determination of acceleration due to gravity
5. Projectile Motion—Relationship between θ and Range
6. Projectile challenge—Shoot the given target suspended from ceiling

7. Hooke's Law: Springs in series and parallel
8. Elastic force in rubber bands—Nonlinear spring
9. Atwood's machine—Verification of Newton's First Law
10. Relationships between F_c and r for uniform circular motion
11. Rotational dynamics—Relationships among rotational variables
12. Conservation of mechanical energy spring-mass system—Air track
13. Conservation of linear momentum—The three kinds of collisions—air track
14. Simple pendulum—Photogate and spring-mass system—Force sensor
15. Physical pendulum—Relationship between T and d
16. Center of mass of flat discs of various shapes

Each lab will require:

- The formation of an hypothesis or hypotheses, based on in-class discussion of the presented problem or focus of each experiment
- Design of (an) experiment(s), also based on in-class discussion, to test the hypothesis or hypotheses
- Collection of data and observations
- Calculations using the collected data
- Conclusions about how well the hypothesis or hypotheses held up based on the experiment
- Class discussion of variance and error analysis
- Written report **[C7]**

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

Aug. 9–24

Introduction

- Units and Measurements
- Scalars and Vectors
- Kinematics **[C1]**
- Motion in 1-D
- Motion in 2-D

C1—Kinematics

- Projectiles
- Uniform Circular Motion

- Relative Motion

Aug. 25–Sept. 7

Newton's Laws of Motion and Classical Mechanics [C2]

C2—Newton's laws of motion

- Force and Mass
- Tension and Normal Reaction
- Uniform Circular Motion
- Friction
- Drag Force

Sept. 8–28

Linear Momentum [C4]

C4—Systems of particles, linear momentum

- Impulse and Linear Momentum
- Law of Conservation of Linear Momentum
- Two-Body Collisions in 1-D and 2-D

Sept. 29–Oct. 12

Rotational Kinematics

- Constant Angular Speed
- Constant Angular Acceleration
- Relationships between Linear and Angular Variables

Oct. 13–26

Rotational Dynamics [C5]

C5—Circular motion and rotation

- Rigid Bodies
- Moment of Inertia and Torque
- Rotational Variables and Newton's Second Law
- Angular Momentum
- Conservation of Angular Momentum

- Rotational Equilibrium
- Mechanical Equilibrium
- Rolling Motion

Oct. 27–Nov. 2

Work, Energy, and Power [C3]

C3—Work, energy, and power

- Work
- Energy
- Conservation of Energy
- Work done by Conservative and Nonconservative Forces
- Work Due by Variable Forces
- Kinetic and Potential Energies
- Conservation of Mechanical Energy
  - Translational Motion
  - Rotational Motion
  - Rolling Motion

Nov. 3–14

Gravitation [C6]

C6 - Oscillations and gravitation

- Newton's Law of Gravitation
- Gravitational Potential Energy
- Motion of Planets and Satellites
- Kepler's Laws
- Critical and Escape Velocities

Nov. 15–Dec. 1

Oscillations [C6]

- Simple Harmonic Oscillations
  - Kinematics
  - Dynamics
- Simple Pendulum

- Spring Mass System
- Physical Pendulum

Dec 4–8

Review

Dec. 11–15

Finals Week