

AP Physics C: Mechanics

3643S & 3644S

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<http://ihsphysics.weebly.com/> (Google: "Irondale Physics")

Course Description:

Calculus 1 is a prerequisite for this course.

Physics is the study of matter, energy, and their interactions. As a fundamental science, it is key for students to have an understanding of physics to gain a more complete picture of the world. In this lab-based course, students will study linear motion, force, gravitation, energy, momentum, rotational motion, oscillations, and waves.

This two-semester course is excellent preparation for college-bound students interested in careers in science or engineering and is equivalent to the first semester of a college level calculus based Physics course. The course also prepares students for the AP Physics C: Mechanics test that occurs in May.

All physics students are required to participate in and attend Irondale's annual Physics Fair. This is an evening event at Irondale that is usually the Tuesday before spring break. Please contact a Physics teacher with any questions regarding the Physics Fair or to confirm specific dates for the Physics Fair.

Irondale's 2020 Physics Fair will be the evening of Tuesday, March 10th.

Learner Outcomes:

The purpose of this course is for students to become...

1. familiar with major physics concepts
2. better "question askers" and problem solvers by working through problems in the context of physics
3. more familiar with scientific process
4. prepared for the AP Physics C: Mechanics exam on Monday, May 4th, 2020 at 12:00 noon (week 1!)

Kinematics

U1: Motion in One Dimension (Ch. 1 & 2)

- 1D Constant Velocity & Acceleration
- Avg. & Instantaneous Velocity
- Kinematic Equations

U2: Motion in Two Dimensions (Ch. 3 & 4)

- Vector Addition, Multiplication

- Projectile, Relative Motion

Newton's Laws

U3: Newton's Laws of Motion (Ch. 5 & 7)

- Newton's 1st, 2nd, & 3rd Laws
- Free Body Diagrams

U4: Special Applications of 2nd Law (Ch. 6)

- Atwood's and Modified Atwood's

- Multi-object systems
- Non-massless string

Energy, Work, and Power

U5: Energy, Work & Power (Ch. 10 & 11)

- Energy “Accounts”
- Hooke’s Law
- Elastic & Inelastic Interactions
- Work & Power

Impulse & Momentum

U6: Momentum in One Dimension (Ch. 9)

- Momentum & Impulse
- Conservation of Momentum

Rotational Motion & Gravity

U7: Rotational Kinematics (Ch. 4.5 – 4.7, 8, 13)

- Uniform and Nonuniform Circular Motion
- Centripetal Force, Orbits, Gravitation

U8: Rotation of Rigid Bodies (Ch. 12)

- Center of Mass, Energy, Moment of Inertia
- Torque, Rotational Kinematics & Dynamics
- Rotational Momentum, Cross Product

Oscillations

U9: Oscillations & Gravity (Ch. 14)

- Simple Harmonic Motion (SHM)
- SHM Dynamics & Energy
- Dampened & Driven Oscillations
- Kepler’s Laws

Topics may be addressed, not on the AP test

- Sound, Waves, Light, Electricity & Magnetism

More detailed learning targets and outcomes can be found on the course web page.

Required Materials:

- (1) *Physics for Scientists and Engineers*, 2nd ed., Knight. (Replacement cost ~\$100)
- (2) Scientific/graphing calculator
- (3) Pencil & notebook
- (4) Three-ring binder. Your three-ring binder will keep you organized and will become a portfolio to prove to a college/university your fulfillment of lab requirements to obtain credit.

Optional (but strongly recommended):

AP Physics C test review book: *Cracking the AP Physics C Exam*, by The Princeton Review

This book is *not* required and is *not* provided for you (can be purchased for about \$14 new on Amazon), but many students have found it to be very beneficial in preparing for the AP test.

Classroom Policies:

Thank you, in advance, for being...

1. **Responsible**
2. **Respectful**
3. **Ready to Learn**

Attendance:

Excused and unapproved absences will not arbitrarily result in reduction in grades, but failure to complete work will usually affect grades. Students and/or parent or guardian are responsible for requesting make-up work for each day's absence. Students will be allowed two school days make-up time for each day of excused absence, with the exception of long-term assignments of 10 or more school days. Long-term assignments will be due the day the student returns to school. These times may be extended at the discretion of the teacher. Students will be allowed one day to make up work in the case of unapproved absences. Teachers are responsible for providing assignments after student or parent/guardian request.

Tardies:

Students will be assigned to after school detention (ASAP) or lunch detention based on unexcused absences and after reaching the following benchmarks for tardies *to one class*:

- 3 tardies: teacher contacts student's parent or guardian
- 5 tardies: student assigned to two days of lunch detention
- 10 tardies: student assigned to one week of lunch detention; letter sent home
- 20 tardies: dean will meet with student and family

Academic Honesty:

Mounds View School Board Policy EG-3109 Student Rights and Responsibilities:

Academic honesty is required to ensure an accurate measurement of a student's academic knowledge. The Mounds View School Board expects that students will achieve success with integrity. Academic dishonesty impairs a true showing of academic achievement. Substantiated reports of academic dishonesty will result in appropriate consequences as defined in accompanying regulations and in student handbooks. Examples of academic dishonesty include, but are not limited to: theft and use of tests; use of crib sheets or other cheating devices on an exam; plagiarism or representation of a substantial piece of work as one's own without proper attribution. This policy applies to all manner, including the most current technological advances, systems, or equipment, that may be utilized for the purposes of academic dishonesty.

Academic dishonesty will be considered a behavioral infraction. The following guidelines will be utilized when a violation of academic honesty occurs:

- Consequences will be commensurate with the severity of the incident
- Consequences cannot prevent growth and development or an accurate measurement of student achievement
- Measures will be sought to determine why the academic dishonesty occurred
- Students will be required to provide a written explanation of behavior
- Students in violation of this policy will not escape the performance indicator; student knowledge will still be measured within an agreed timeframe set by teacher, dean, and student
- Additional consequences may include:
 - Re-examination of content; repeat of project, paper, or activity
 - Possible reduced score/grade not to prevent achieving a level of proficiency
 - Other measures identified in Mounds View School Board Policy EG-3109: Student Rights and Responsibilities
 - Multiple offenses may result in loss of credit, to be determined by building principal

(Irondale Student Handbook 8).

Grading Scale:

- In this course, we use equal interval grading to assess student progress.
- The purpose of the equal interval scale is to encourage proficiency rather than the accumulation of points and to support student growth over the course of the semester.
- Students and parents are encouraged to communicate with teachers if current progress does not seem adequate; we can then work together to find strategies to improve proficiency.

Individual Assignment Grade Configuration		
Gradebook Entry	Description	Point Value
A	Went beyond the basic requirements for proficiency	4
B	Met all the basic requirements for proficiency.	3
C	Met some basic requirements for proficiency	2
D	Met very few basic requirements for proficiency.	1
I	Didn't show enough work to demonstrate proficiency	0
M	Missing Evidence of Proficiency	0

Final Grade Configuration		
A	3.60	4.00
A-	3.20	3.59
B+	3.01	3.19
B	2.59	3.00
B-	2.40	2.58
C+	2.21	2.39
C	1.79	2.20
C-	1.60	1.78
D+	1.41	1.59
D	0.99	1.40
D-	0.80	0.98
I	No Value Assigned	

Note: Regardless of the final mathematical calculation, students who do not complete required assessments will receive a final grade of I (recovered in summer school, or through after-school credit recovery programming) or NG (recovered with the classroom teacher within three weeks of the semester's end).

Gradebook Setup:

Semester 1

Homework/Quizzes:	5%
Labs:	25%
Unit Tests:	55%
Final Test:	15%

Semester 2

Homework/Quizzes:	5%
Labs:	15%
Physics Fair:	20%
Unit Tests:	45%
Final Test:	15%

Accessing Grades:

Parents can access grades through ParentVUE. Parents will be able to see assignments for each class, and the assignments may have a score or a code (or both). Assignments may also include written comments from the teacher.

Mi = Missing (the assignment is missing and is currently counting as a score of zero)

Ab = Absent (the student was absent when the assignment was given or due)

La = Late (the assignment was turned in late)

Inc = Incomplete (the turned in assignment was not complete)

TI = Turned in (the assignment is turned in but does not yet have a score)

WIP = Work in progress (the student is working on the assignment and although it is not completed, it is not missing--this is often used for projects that have multiple parts)

Relearning Opportunities:

- Who **must** reassess? Students who earn an "I" on tests or quizzes
- Who **can request** to reassess? Students who earn a "D" on tests or quizzes
- When can students reassess?
 - Quizzes must be reassessed before the unit test, and unit tests reassessed before next unit test
 - The reassessment process occurs outside the class period (before/after school, Knight Time).
- How can students relearn before a reassessment?
 - Students will be provided additional practice either on the course website or directly by teacher
 - All homework assignments and lab activities from the unit must be completed
 - Students will have the opportunity for additional help during Knight Time
 - Students will have relearning opportunities in the normal sequence of the course as the course often spirals back on previous topics via homework or daily questions
- What does a reassessment look like?
 - Prior to a unit retest, a student will meet with the teacher to go over the original test and identify particular concepts or skills that need to be improved upon. Any previous homework and/or labs from the unit need to be completed, as well as any additional opportunities for practice.
 - Prior to a requiz, a student will revisit the learning activities that were designed to prepare the student for the quiz and will briefly discuss with the teacher strategies to prepare for the requiz.
- How does reassessment impact a student's grade?
 - The retest and requiz score will replace the original score, up to a grade of "C".

Homework Rubric

Elements of a complete problem solving process:

- Statement of the applicable fundamental starting concept, relationship, or skill
- A simplified visual representation of the system (often a labeled sketch or diagram)
- The process of solving the problem is shown (often referred to as "showing your work")
- A reasonable answer with correct units

A All four elements present

B Three of the elements present

C Two of the elements present

D One of the elements present

I No visible evidence of the problem solving process

Quiz/Test Proficiency Levels

Quizzes and tests have been structured in order to have the following percentage ranges correlate with the corresponding letter grades and proficiency levels.

A	beyond basic requirements for proficiency	90 - 100%
B	basic requirements for proficiency	70 - 89%
C	some (most) basic requirements for proficiency	60 - 69%
D	very few basic requirements for proficiency	50-59%
I	proficiency not demonstrated	0-49%

Lab Report Proficiency Levels

- A Robust conceptual understanding thoroughly demonstrated, no conceptual mistakes, all essential elements properly completed
- B No conceptual mistakes, slight omission of essential element(s) or slight mistake in completion
- C Slight conceptual mistakes, significant omission or mistake in completion of essential element(s)
- D Significant conceptual mistakes, few essential elements properly completed
- I Conceptual understanding not demonstrated, few to no essential elements properly completed

Standard Lab Report Elements (where applicable):

- Purpose statement
- Collected data
- Graphical representations
 - Axes labeled with units
 - Trendline or curve-fit with equation and R^2 value
- Conclusion written in complete sentences that explains
 - The slope units and physical significance of the slope
 - The vertical-intercept units and physical significance of the vertical-intercept ("y-intercept")
 - The specific equation (inclusion of number values) for the line or curve
 - The general equation (use of symbols in place of number values) for the line or curve.
- Questions answered

Depending upon the lab activity, specific elements may be added or removed.

** If necessary, the teacher will announce any changes that are made to this syllabus.*