

Central High School  
Physics Syllabus  
Mr. D. Ladehoff

## Course Description

Physics is the science of relationships between matter, energy and motion. The student will study kinematics in one and two dimensions, circular motion, potential and kinetic energy, electricity, thermodynamics, and particle physics. Students completing this course should be able to succeed in first-year college physics. An astronomy long-term, overnight project concluded the first semester with student interest project for second semester.

## Course Objectives

Know that atoms are made of sub-atomic particles (protons, neutrons, electrons) which have positive, neutral, or negative charges.

Understand the magnitude of a force using  $F=ma$ .

Know that whenever a force is exerted by one object to another, an equal and opposite force is exerted back on the first object.

Understand that momentum is conserved.

Distinguish between inertia and gravitational mass.

Understand Newton's Law of Universal Gravitation.

Understand the types of motion such as linear, circular, parabolic, and periodic.

Understand energy is the ability to change matter or the ability to do work; the ways to measure energy; and the difference between potential and kinetic energy.

Understand that energy, defined somewhat circularly, is the ability to change matter or the ability to do work.

Understand that energy is defined by the way it is measured or quantified.

Understand the difference between potential and kinetic energy.

Understand that like charges repel and opposite charges attract.

Understand that a magnetic field is generated around an electrical current and that certain materials are insulators and others conductors of electricity.

Understand properties of waves such as reflection, refraction, interference, as well as frequency, wavelength, amplitude, and the way energy travels in sound and light.

Understand that a magnetic field is generated around an electrical current and that the motion of a conducting wire through a magnetic field generates a current through it.

Understand that in some substances, such as metals, electrons flow easily, whereas in insulating materials such as glass they can hardly flow at all. Semiconducting materials have intermediate behavior. At very low temperatures, some materials offer no resistance to the flow of electrons and become superconductors.

Know the first two laws of thermodynamics: (1) Energy is conserved (neither created nor destroyed) and (2) Heat flows naturally from a hot object to a cold object; heat will not flow spontaneously from a cold object to a hot object.

Indicate that the speed of light differs in some material from its speed in a vacuum is given by the index of refraction for that material,  $n$ , where  $n$  is the ratio of the speed of light in a vacuum to the speed of light in the material.

Know that light follows the path of least time through various materials and that this is not the same as the shortest distance.  
Understand the reflection, refraction, diffraction, interference, and frame of reference properties of waves.  
Understand that sound causes molecules of a medium vibrate back and forth. This series of compressions and rarefactions produces waves.  
Understand how sound travels through different mediums.  
Understand amplitude, frequency, wavelengths, intensity, and quality.  
Know that intensity is measured in decibels.  
Understand that objects change their velocity only when a net force is applied (the law of inertia).  
Students will be able to distinguish between inertial mass and gravitational mass.  
Understand simple machines and how they provide mechanical advantage.  
Understand the principles of air pressure and fluid dynamics. Understand Archimedes' Principle and Bernoulli's Principle.  
Understand that the electrical force is a universal force that exists between any two charged objects.

## Required Materials

Paper for laboratory reporting  
Spiral notebook  
Student handbook

## Textbook

Physics, Cutnell, Winston Press, 2006

## Quizzes

The occasional need to discover how you are progressing will require the occurrence of a quiz or two depending on the difficulty of the unit. There may not be a formalized or verbalized notice for a quiz.

## Laboratory Reports

The writing of laboratory reports will consist of a title page, a data collection page or table (include with that the required calculations), answers to questions in complete sentences, and a conclusion paragraph telling what you learned of the lab and its relevance towards your understanding of the physics.

## Instructor Contact

I can be reached through e-mail at [dladehoff@cusd4.org](mailto:dladehoff@cusd4.org), in B154 before school Monday, Tuesday, and Wednesday,

## Grades

A final grade in this course is based upon the following:

|               |      |       |
|---------------|------|-------|
| Homework      | :15% |       |
| Quizzes       | :15% |       |
| Laboratory    | :15% |       |
| Tests         | :30% |       |
| Final Project | :10% |       |
| Final Exam    | :15% | =100% |

## Homework

The addition of a textbook with emphasis on physics and its relevance to modern applications is the primary source for homework problems. The textbook will need to be used by the student on a daily basis. The text is available on-line at <http://www.wiley.com/college/cutnell>

## Final Project

|                                  |         |
|----------------------------------|---------|
| Overnight Astronomy              | Nov. 10 |
| Astronomy 1 <sup>st</sup> Sem    | Jan. 10 |
| Rube Goldberg                    | Feb. 11 |
| Six Flags                        | May 9   |
| Team Inquiry 2 <sup>nd</sup> Sem | May 17  |

## Test

Tests 1<sup>st</sup> Semester

Mathematical concepts, kinematics in one dimension, kinematics in two dimensions-  
Sept. 22

Forces and Newton's Laws of Motion, dynamics or uniform circular motion, work and energy- Oct. 21

Impulse and momentum, rotational kinematics, rotational dynamics, simple harmonic motion and elasticity- Nov. 19

Fluids, temperature and heat, transfer of heat, Ideal Gas Law and Kinetic Theory, Thermodynamics- Dec. 16

Final Exam 1<sup>st</sup> Semester- Jan. 11  
Tests 2<sup>nd</sup> Semester

Waves and sound, the Principle of Linear Superposition and interference phenomena-  
Feb. 3

Electric forces and electric fields, electric potential energy and the electric potential,  
electric circuits- Mar. 4

Electromagnetic induction, alternating current circuits, electromagnetic waves- April 8

The reflection of light: mirrors, lenses and optical instruments, interference and the wave  
nature of light- May 20