Physics 202 Syllabus

The properties of matter and energy

Spring 2013

CRN	20693, 21641 (3 credits)
Date/Time	6:00–8:50 pm
Campus	PCC Rock Creek Bldg 7
Room	223/225
Instructor	David J. Ulrich
Website	http://spot.pcc.edu/~dulrich/
E-mail	david.ulrich15@pcc.edu
Office	Building 7, Room 202
Office Hours	After class

Course Overview

This course will cover such topics as elastic and fluid motion, heat and temperature, kinetic theory, wave motion, sound, and light. In addition, we will touch on some subjects related to quantum mechanics.

Our textbook will be *Physics (9th edition)* by Cutnell and Johnson. We will be covering chapters 10 through 17 and 24 through 27 in this course.

The Course Content and Outcome Guide can be obtained online via the following hyperlink: http://www.pcc.edu/ccog/default.cfm?fa=ccog&subject=PHY&course=202. This includes more course detail and outlines the course prerequisites.

Intended Outcomes

After completion of this course, students will

- Apply knowledge of thermodynamics, sound waves, and light waves to explain natural physical processes and related technological advances.
- Use an understanding of algebraic mathematics along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.
- Design experiments and acquire data in order to explore physical principles, effectively communicate results, and critically evaluate related scientific studies.
- Assess the contributions of physics to our evolving understanding of global change and sustainability while placing the development of physics in its historical and cultural context.

Grading Scheme

Your total grade will be a weighted average of all the assignments in class. The weight for each category of assignments is in the following table.

Category	**Weight**
Exams	50%
Lab Work	30%
Quizzes	20%

Exams

See the class schedule below for the date of the midterm and final exam. They will consist of problems taken from sources other than the homework. These exams will be *open* book. The entire three hour period will be given to complete each test. The final will not be cumulative.

Any form of cheating on any exam will result in a fail grade.

Lab Work

The lab worksheets are available on the website. Please bring your own copy to work on. You will be required to record your data and observations, answer the questions, and return them to me before you leave. There will be no take- home work required with the labs. Only those present will receive credit for participating. There will be no make-up labs. You will not be allowed to make up work by attending other physics classes.

Weekly Quizzes

The first half-hour of each Monday will be used for a short quiz. The quiz questions will be taken from the previously assigned homework assignment. The tests will be closed book with *no notes*. I'll provide a set of equations from the book and lecture notes. If you need help remembering an equation or the value of some constant during the quiz, I will certainly be willing to tell you—please don't hesitate to ask during the test.

Homework

All the weekly homework assignments are available on the website. The answers and some of my solutions are also available. The assignments will not graded so use the materials as you see fit. The quiz problems will be similar to these problems so it is in your best interest to do them when assigned.

See http://www.pcc.edu/resources/academic/standards-practices/ for more detail on PCC Grading Guidlines.

Miscellaneous

Attendance and make-up policies Attendance is required for any lab, quiz, or exam. The instructor reserves the right to administer or refuse to admininster any make-up work for lack of attendance.

Instructional ADA statement If you require specific instructional accommodations, please notify me early in the course. A request for accommodation may require documentation of disability through the Office for Students with Disabilities at 977-4341.

Code of student conduct Information may be found through this http://www.pcc.edu/about/policy/student-rights/.

Academic integrity statement Students are required to complete this course in accordance with the Student Rights and Responsibilities Handbook. Dishonest activities such as cheating on exams and submitting or copying work done by others will result in disciplinary actions including but not limited to receiving a failing grade. See the Academic Integrity Policy for further details: http://www.pcc.edu/about/policy/student-rights/.

Flexibility statement The instructor reserves the right to modify course content and/or substitute assignments and learning activities in response to institutional, weather, and class problems.

Withdrawal policy As the student, it is your responsibility to process a Drop via the Web or at a Registration Office within the specified time periods set forth by PCC. Deadlines can be located at http://www.pcc.edu/registration/dropping.html.

Class Schedule

This following schedule should be considered tentative. In particular, based on class progress, we may slow down or speed up the lecture schedule.

Wk	Day	Date	Type	Title
1	Mon	Apr 01	Lecture 1	Vibration and Oscillation
1	Wed	Apr 03	Lecture 2	Elasticity
2	Mon	Apr 08	Lab 1	Simple Harmonic Motion
2	Wed	Apr 10	Lecture 3	Fluids
3	Mon	Apr 15	Lab 2	Archimedes' Principle
3	Wed	Apr 17	Lecture 4	Heat and Temperature
4	Mon	Apr 22	Lab 3	Calorimetry
4	Wed	Apr 24	Lecture 5	Kinetic Theory
5	Mon	Apr 29	Lecture 6	Thermodynamics
5	Wed	May 01	Exam 1	Midterm
6	Mon	May 06	Lab 4	Waves on Strings
6	Wed	May 08	Lecture 7	Radiation: Particles, Waves, Rays
7	Mon	May 13	Lab 5	Harmonics and Sound Waves
7	Wed	May 15	Lecture 8	Geometric Optics
8	Mon	May 20	Lab 6	Mirrors and Lenses
8	Wed	May 22	Lecture 9	Wave Interference
9	Mon	May 27	Lab 7	Interference of Light
9	Wed	May 29	Lecture 10	Quantum Optics and Least Action
10	Mon	Jun 03	Holiday	
10	Wed	Jun 05	Lecture 11	Limits of Classical Mechanics
11	Mon	Jun 10	Exam 2	Final Exam

Course Content

- MECHANICAL PROPERTIES OF MATTER
  - Define the states of matter.
  - Develop the following concepts and solve problems involving them:
    - Density and specific gravity
    - Hookes Law and other stress-strain law
    - Pressure in liquids and gases
    - Archimedes principle
  - Understand the principles of and the workings of a mercurial barometer.
  - Study the motion of fluids by developing understanding of viscosity, Poiseville's Law, Bernoulli's Equation and Torricelli's theorem.
- TEMPERATURE, MOTION AND THE GAS LAWS
  - Understand the workings of various types of thermometers and the various temperature scales they employ.
  - Develop skill in solving gas law problems. This involves understanding the general gas law, the gas-law constant, avogadros number, etc., as well as Boyles' Law, Charles Law and Guy-Lussac's Law.
  - Clarify the relationship of molecular motion to temperature.
- THERMAL PROPERTIES OF MATTER
  - Understand heat as energy.
  - Distinguish and define several heat units such as calories, kilocalories, British thermal units and to relate them to other energy units.
  - Discuss the specific heats of various materials.
  - Develop a knowledge of the latent heats of fusion and boiling/ evaporation and develop skills in problem solving using these concepts.
  - Define calorimetry.
  - Explain expansion and contraction of various materials.
  - Study convection, conduction and radiation.
- THERMODYNAMICS
  - State the first Law of Thermodynamics and understand its implications.
  - Explain cyclic process and apply this to heat engines.
  - State the Second Law of Thermodynamics and understand its implications.
  - Develop an appreciation of the concepts of order, disorder and entropy.
- VIBRATORY MOTION
  - Develop an understanding of vibrating systems such as springs.
  - Study the special case known as simple harmonic motion, and relate it to sinusoidal variations.

  - Solve problems involving pendulums and many other vibrating bodies.
  - Consider forced vibrations.

- WAVE MOTION
  - Study waves on strings and other transverse waves.
  - Delineate what happens when a wave motion reflects.
  - Develop an understanding of resonance and standing waves, on a string for example.
  - Explain longitudinal waves.
  - Solve many types of problems involving wave motion.

- SOUND
  - Explain the origin, speed and intensity of sounds.
  - Delineate pitch and quality of sounds.
  - Learn to recognize interference of sound waves including the phenomenon of beats.
  - Explain the resonance of air columns.
  - Apply Doppler Effects to sound.

- PROPERTIES OF LIGHT
  - Explain light as energy.
  - State the speed of light and describe how it can be measured.
  - Define reflection.
  - Discuss plane, concave and convex mirrors.
  - Explain how images both real and virtual are formed.
  - Explain refraction and how to apply Snell's Law.
  - Discuss total internal reflection and apply it to fiber optics.
  - Explain the thin-lens formula and how to apply it.
  - Learn about combinations of lenses.

- OPTICAL DEVICES
  - Study the eye and compare it to a simple camera.
  - Define diopter units.
  - Explain a simple magnifier.
  - Explain the operation of a microscope.
  - Explain the operation of astronomical telescopes.
  - Explain the operation of binoculars.
  - Explain the operation of a prism spectroscope.

- INTERFERENCE AND DIFFRACTION
  - Define diffraction and gain an understanding of its occurrences.
  - Explain the Michelson Interferometer.
  - Explain thin film interference.
  - Explain and employ diffraction gratings.