# PHYS-1220: COLLEGE PHYSICS II

## Cuyahoga Community College

### Viewing: PHYS-1220 : College Physics II

**Board of Trustees:**
2018-05-24

**Academic Term:**
Fall 2021

**Subject Code**
PHYS - Physics

**Course Number:**
1220

**Title:**
College Physics II

**Catalog Description:**
Introductory algebra-based physics course designed for non-physics majors covering areas of physics which include electricity, magnetism, waves, sound, light, special relativity, atomic and nuclear physics.

**Credit Hour(s):**
4

**Lecture Hour(s):**
3

**Lab Hour(s):**
3

**Other Hour(s):**
0

### Requisites

**Prerequisite and Corequisite**
PHYS-1210 College Physics I.

### Outcomes

**Course Outcome(s):**
Apply fundamental principles of electromagnetism, wave motion, sound, light, optics, wave-particle duality, atoms, relativity, and the nucleus to applications in engineering technology, health careers, and daily life.

**Objective(s):**
1. Apply Coulomb's law describing the electrostatic interaction between point charges and solve qualitative problems involving Gauss's law.
2. For discrete charge distributions, calculate the net electric field, net potential and the electric potential energy; solve problems involving relationships among electric fields, potential and potential energy.
3. Analyze circuits involving resistance and capacitance, including equivalent resistant, equivalent capacitance, circuits with DC sources, and the transient behavior of RC circuits.
4. Find the force on charged particles and current-carrying wires due to magnetic fields, and find the magnetic field due to current.
5. Apply Faraday's law and Lenz's law to problems involving electromagnetic induction.
6. Analyze circuits involving resistors, capacitors and inductors for their transient behavior and the behavior when connected across AC sources.
7. Describe the influence of electromagnetism, wave motion, sound, light, optics, wave-particle duality, atoms, relativity, and the nucleus on the environment.

**Course Outcome(s):**

Apply critical thinking skills to solve practical and theoretical problems utilizing fundamental principles of electromagnetism, wave motion, sound, light, optics, wave-particle duality, atoms, relativity, and the nucleus.

**Objective(s):**

1. Apply principles of modern physics to solve problems involving quantization of energy and momentum on topics as black body radiation, the photoelectric effect and Compton effect.
2. Solve problems involving relationships among electric fields, electric potential, and electric potential energy.
3. Explain and follow laboratory safety procedures.
4. Solve problems involving electromagnetic radiation, including problems on such concepts as energy density, intensity, polarization, radiation pressure and momentum.
5. Use the principles of geometric optics to solve problems involving reflection and refraction of light in applications such as plane mirrors, spherical mirrors and thin lenses.

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**Course Outcome(s):**

Perform, support, analyze, and express results of laboratory experiments in written form

**Essential Learning Outcome Mapping:**

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

**Objective(s):**

1. Demonstrate techniques to setup and perform experiments and collect data.
2. Determine and report on likely sources of experimental error.

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**Methods of Evaluation:**

1. Quizzes
2. Hour examinations
3. Final examinations
4. Formal laboratory reports
5. Informal laboratory reports
6. Problem assignments
7. Group work
8. Student presentations
9. Other or some combination of the above.

**Course Content Outline:**

1. Waves
   a. The nature and mathematical description of waves
   b. Sound waves and intensity
   c. Doppler effect
   d. Applications of sound in medicine
   e. The principle of linear superposition
   f. Interference and diffraction
2. Electric forces, fields, and energy
   a. Charges and source of electric fields and forces
   b. Conductors and insulators
   c. Coulombs law
   d. Gauss"s law
   e. Electric fields and field lines
   f. Copiers and computer printers
   g. Electric energy and potential
   h. Capacitors and dielectics
   i. Biomedical applications of electric potential differences
3. Electric circuits
   a. Electromotive force and current
   b. Resistors and Ohm"s law
   c. Serial and parallel circuits

   d. RC circuits
   e. Measurement of current and voltage
   f. Safety and physiological effects of current
4. Magnetic forces and fields
   a. Source of magnetic fields and forces
   b. Force of magnetic field on s moving charge
   c. The motion of a charge particle in a magnetic field
   d. Ampere"s law
   e. Magnetic materials
5. Electromagnetic induction
   a. Induced electromotive force and current
   b. Faraday"s law of electromagnetic induction
   c. Lenz"s law
   d. Application of electromagnetic induction to the reproduction of sound
   e. The electric generator
   f. Transformers
6. Alternating currents
   a. Resistors, capacitors, and inductors in AC circuits
   b. Resonance in electric circuits
   c. Semiconductor devices
7. Electromagnetic waves
   a. Nature of electromagnetic waves
   b. Energy carried by electromagnetic waves
   c. The Doppler effect and electromagnetic waves
   d. Polarization
8. Reflection and refraction of light and Interferences of waves
   a. Wave fronts and rays
   b. Reflection of light with mirrors
   c. Refraction of light with lenses
   d. Compound microscopes
   e. Telescopes
   f. Interferences and Young"s double-slit experiment
   g. X-ray diffraction
9. Special relativity
   a. Events and inertial reference frames
   b. The postulates of special relativity
   c. Relativity of time and length
   d. The  equivalence of mass and energy
   e. Relativistic addition of velocities
10. Particles and waves
   a. Black body radiation and birth of quantum mechanics
   b. The wave particle duality
   c. The photoelectric effect
   d. The Heisenberg uncertainty principle
11. Atomic and nuclear physics
   a. Rutherford scattering and the nuclear storm
   b. Bohr"s Model of the hydrogen atom
   c. Quantum mechanical picture of the hydrogen atom
   d. Pauli exclusion principle and the periodic table
   e. X-rays and lasers
   f. Medical application of the laser
   g. Holography
   h. The strong nuclear force and the stability of the nucleus
   i. Radioactivity
12. Laboratory work
   a. Safety in the laboratory
   b. Physical measurement

c. Experimental error
d. Laboratory reports

## Resources

Cutnell Johnson. *Physics.* 10th. Wiley, 2015.

Giancoli, Douglas C. *Physics, Principles with Applications.* 7th ed. Pearson, 2014.

Giambattista, Alan. *College Physics.* 4th ed. McGraw Hill, 2013.

Serway, Richard. *Principles of Physics.* 2nd ed. Saunders College, 1998.

Vacha, Terrance H. *Lab manual for 1210.* Cuyahoga Community College, 2001.

Wilson, Jerry D. *Physics Laboratory Experiments.* 8th ed. Boston, New York: Houghton Mifflin, 2014.

Zatko, Frank. *Physics Labs with Computers, Vols 1 2.* PASCO Scientific, 1999.

Knight, Randall D; Jones, Brian; and Field, Stuart. *College Physics: A Strategic Approach.* 3rd. Pearson, 2017.

**Resources Other**

1. "Easy Java Simulations". www.compadre.org/osp (http://www.compadre.org/osp/)
2. "Phet Simulations". Phet.Colorado.edu
3. Audio-visual materials: videos, dvds, audio recordings, computer programs and simulations
4. Laboratory experiments developed by current and past instructors
5. Online homework and study programs

## Instructional Services

**OAN Number:**
Ohio Transfer 36 TMNS

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