Administrative Unit: Science Department

Course Prefix and Number: PHYS 212

Course Title: Calculus-based Physics II

Number of Credit Hours: 5  Lecture Hours: 3  Laboratory Hours: 3

Catalog Description: This is the second of the two-part algebra-based college physics sequence. The course will cover the following major areas of physics: electricity, magnetism, optics, modern physics, and astrophysics (optional). The course includes laboratory experiences based on the above topics. Offered on demand.

Prerequisite(s)/Corequisite(s): PHYS 211

Text(s): Most current editions of the following:


Giancoli, D.C. Physics for Scientists and Engineers. Prentice Hall.


Benson, H. University Physics. J. Wiley.

Lab Texts:


Course Objectives:

- To describe the properties of fluids.
- To apply the laws of thermodynamics.
- To examine electricity and magnetism.
- To investigate light and optics.
- To outline modern physics and astrophysics (optional).

Measurable Learning Outcomes:

- Calculate density and pressure in a fluid.
- Apply Archimedes/principle and the Bernoulli equation.
- Define heat and temperature.
- State and apply the laws of thermodynamics.
- Describe electrical charges and fields.
- Apply Coulomb’s law.
- Define electrical potential.
Describe capacitors and dielectrics.

Define electrical resistance and apply Ohm's law.

Analyze electrical circuits.

Define magnetic field.

Calculate the magnetic force on moving charges and on current-carrying wires and coils.

Define magnetic flux and apply Faraday's law of induction.

Describe electrical generators, motors, and transformers.

Calculate frequency, wavelength, energy, and momentum of electromagnetic radiation.

Analyze reflection and apply to the case of plane and spherical mirrors.

Analyze refraction and apply the thin-lens equation.

Describe optical instruments such as telescopes and microscopes.

Describe superposition and interference in light waves.

Topical Outline (major areas of coverage):

- Fluids
  - Density, pressure, and buoyancy
  - Equations of continuity
  - Fluid mechanics and Bernoulli equation

- Thermodynamics
  - Temperature and heat
  - Heat capacity and specific heat
  - Heat transfer and thermal processes
  - Laws of Thermodynamics

- Electricity and Magnetism
  - Electrical forces and electric fields
  - Electric energy and capacitance
  - Current and resistance
  - Direct-current circuits
  - Magnetism
  - Induced voltage and inductance
  - Alternating currents and electromagnetism

- Light and optics
  - Reflection and refraction of light
  - Mirrors and lenses
  - Wave optics
  - Optical instruments

Material from this course may be tested on the Major Field Test (MFT) administered during the Culminating Experience course for the degree.

Recommended maximum class size for this course: 24

Library Resources: Online databases are available at http://www.ccis.edu/offices/library/resources.asp. You may access them from off-campus using your eServices login and password when prompted.
NOTE: The intention of the master syllabus is to provide an outline of the contents of this course, as specified by the faculty of Columbia College, regardless of who teaches the course, when it is taught or where it is taught. Faculty members teaching this course for Columbia College are expected to facilitate learning pursuant to the course objectives and cover the subjects listed in the topical outline. However, instructors are also encouraged to cover additional topics of interest so long as those topics are relevant to the course’s subject. The master syllabus is, therefore, prescriptive in nature but also allows for a diversity of individual approaches to course material.

Office of Academic Affairs
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