

PHYS 2B: GENERAL PHYSICS

Foothill College Course Outline of Record

Heading	Value
Units:	5
Hours:	4 lecture, 3 laboratory per week (84 total per quarter)
Prerequisite:	PHYS 2A.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Students should be able to solve problems involving the relationships between charges, forces and fields for both electricity and magnetism, the concept of voltage, and simple circuits.
- Lab experiments should teach students the background science, error analysis, and how to perform experiments.
- Students should understand the following concepts from Thermodynamics:1. Distinctions between temperature, heat and energy.2. PV diagrams3. First and Second Laws of Thermodynamics

Description

Lectures, demonstrations, and problems in thermal physics; electricity and magnetism and fluids.

Course Objectives

The student will be able to:

- Explain the zeroth, first and second laws of thermodynamics, and solve related problems and calculate results from statistical mechanics, such as the kinetic theory of gases.
- Discuss basic electrostatics and electric potential, and solve related problems.
- Analyze resistance, capacitance, and DC circuits, computing associated quantities.
- Discuss magnetic fields and forces, and solve related problems.
- Extrapolate their understanding of DC circuits and circuit elements to AC circuits.
- Explain electromagnetic waves.
- Analyze and solve problems in fluids.
- Assess the limitations of physical laws and make mathematical approximations in appropriate situations.
- Understand how physical laws are established and the role of scientific evidence as support.

Course Content

- Explain the zeroth, first and second laws of thermodynamics and solve related problems and calculate results from statistical mechanics, such as the kinetic theory of gases.
 - Temperature
 - Thermometers
 - Zeroth law of thermodynamics
 - Thermal expansion

- Heat
 - Definition of heat
 - Calorimetry and phase changes
 - Specific heat
 - Heat of vaporization
 - Heat of fusion
- First law of thermodynamics
 - Definition of work
 - Relationship between work and heat
 - Definition of internal energy
 - Adiabats
 - Isotherms
- Heat transfer processes
 - Conduction
 - Convection
 - Radiation
- The kinetic theory of gases and the Maxwell-Boltzmann distribution functions
 - Molecular model of a gas
 - Temperature
 - Molar specific heat of an ideal gas
 - Maxwell-Boltzmann distribution
- Entropy, heat engines, and the second law of thermodynamics
 - Definition of a heat engine
 - Work done
 - Efficiency
 - Kelvin-Planck formulation of the second law
 - Definition of a refrigerator
 - Coefficient of performance
 - Clausius formulation of the second law
 - Reversible and irreversible processes
 - The Carnot cycle
 - Efficiency
 - Applications to the second law
 - Entropy
 - Macroscopic definition
 - Entropy and irreversibility
 - Microscopic/probabilistic definition
- Discuss basic electrostatics and electric potential, and solve related problems.
 - Concept of charge
 - Conductors and insulators
 - Concept of electric force
 - Coulomb's law
 - Concept of electric field
 - Electric field lines
 - Electric field from a point charge and superposition principle
 - Concept of electric potential
 - Equipotential surfaces
 - Electric potential from a point charge and superposition principle
 - Calculating the electric potential from charge distributions
 - Electric potential energy
- Analyze resistance, capacitance, and DC circuits, computing associated quantities.
 - Concept of resistance
 - Current
 - Resistivity
 - Resistance
 - Series and parallel configurations
 - EMF
 - Concept of capacitance
 - Capacitors

- b. Capacitance
- c. Dielectrics
- d. Series and parallel configurations
- e. Energy stored
- 3. Concepts involving DC circuits
 - a. Kirchhoff's rules
 - b. Ammeters and voltmeters
 - c. RC circuits
- D. Discuss magnetic fields and forces, and solve related problems.
 - 1. Concept of magnetism
 - a. Permanent magnets
 - 2. Concept of magnetic fields
 - a. Magnetic field lines
 - b. Magnetic field of moving charges and currents
 - 3. Concept of magnetic force
 - a. Motion of charged particles in magnetic fields
 - b. Force between current carrying wires
 - c. Applications of charged particle motion in magnetic fields
 - 4. Concept of torque on a current loop
 - a. DC motor
- D. Explain electromagnetic induction and inductance, and solve related problems.
 - 1. Concept of induction
 - a. Faraday's law
 - b. Lenz's law
 - 2. Concept of motional EMF
- E. Extrapolate their understanding of DC circuits and circuit elements to AC circuits.
 - 1. Concept of phasors
 - 2. Concept of reactance
 - 3. Concept of resonance
 - 4. Transformers
- F. Explain electromagnetic waves.
 - 1. Maxwell's equations
 - 2. Electromagnetic spectrum
- G. Analyze and solve problems in fluids.
 - 1. Pressure
 - 2. Buoyancy

Lab Content

- A. Suggested labs:
 - 1. Absolute zero
 - 2. Specific heat
 - 3. Ideal gas law/Boyle's law
 - 4. Use of electronic equipment
 - 5. Mapping electric potential
 - 6. Ohm's law
 - 7. Time constant in RC circuit
 - 8. Magnetic field of a solenoid
 - 9. AC circuit

Special Facilities and/or Equipment

- A. Physics laboratory with equipment for teaching introductory thermal physics, electricity and magnetism.
- B. When taught via Foothill Global Access, on-going access to computer with email software and hardware; email address.

Method(s) of Evaluation

- A. Weekly assignments
- B. Mid-term test

- C. Laboratory
- D. Final examination

Method(s) of Instruction

- A. Lecture
- B. Discussion
- C. Cooperative learning exercises
- D. Electronic discussions/chat
- E. Laboratory
- F. Demonstration

Representative Text(s) and Other Materials

Urone and Hinrichs. [College Physics](#). OpenStax, 2012.

Note: OpenStax is the main OER text in the field. The text itself has undergone regular updates since 2012, but the copyright/edition date remains 2012.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

- A. Homework problems: Homework problems covering subject matter from text and related material ranging from 10-40 problems per week. Students will need to employ critical thinking in order to complete assignments.
- B. Lecture: Four hours per week of lecture covering subject matter from text and related material. Reading and study of the textbook, related materials and notes.
- C. Labs: Students will perform experiments and discuss their results in either the form of a written lab report or via oral examination. Reading and understanding the lab manual prior to class is essential to success.

Discipline(s)

Physics/Astronomy