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 - distinctions between temperature, heat and energy; PV diagrams; 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:
A. 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.
B. Discuss basic electrostatics and electric potential, and solve related problems.
C. Analyze resistance, capacitance, and DC circuits, computing associated quantities.
D. Discuss magnetic fields and forces, and solve related problems.
E. Extrapolate their understanding of DC circuits and circuit elements to AC circuits.
F. Explain electromagnetic waves.
G. Analyze and solve problems in fluids.
H. Assess the limitations of physical laws and make mathematical approximations in appropriate situations.
I. Understand how physical laws are established and the role of scientific evidence as support.

Course Content

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

Methods of Evaluation may include but are not limited to the following:

A. Weekly assignments
B. Mid-term test
C. Laboratory
D. Final examination

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

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