PHYS 0010 - BASIC CONCEPTS IN PHYSICS

Catalog Description

Prerequisite: Eligibility for Math D
Advisory: Eligibility for ENGL 11 strongly recommended
Hours: 54 lecture
Description: Introduction to the laws of motion, properties of matter, heat, sound, electricity, magnetism, light, atomic and nuclear physics, and relativity. Emphasis on familiar phenomena in everyday life. Intended for nonscience majors. (CSU, UC-with unit limitation)

Course Student Learning Outcomes

- CSLO #1: Apply basic algebra to associate physical concepts with fundamental physical equations of Newtonian mechanics, electricity, magnetism, thermodynamics, and waves.
- CSLO #2: Identify physical concepts in Newtonian mechanics, electricity, magnetism, and thermodynamics, and modern physics that are evident in common everyday physical phenomena.
- CSLO #3: Explain simple physical systems in terms of physical concepts in Newtonian mechanics, electricity, magnetism, and thermodynamics, and modern physics.

Effective Term

Fall 2022

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

108

Total Student Learning Hours

162

Course Objectives

Upon completion of Physics 10, the student will be able to:
Mechanics:
1. Apply Newton’s Laws and Newton's Universal Law of gravitation to describe and explain the motion of objects.
2. Explain mechanical phenomena in terms of the concepts of work and energy.
3. Apply the concepts of conservation of energy and momentum describe and explain elastic and inelastic collisions.
4. Apply concepts in rotational motion to explain the circular motion of point particles and the rotational motion of rigid bodies.
Properties of Matter:
1. Describe the parts of the atom.
2. Define and explain density.
3. Apply and explain the law of scaling.
4. Describe the variation of pressure in a liquid.
5. Apply Pascal's and Archimedes’ principles to explain common fluid phenomena.
6. Apply a conceptual model to explain the effects of temperature and volume on the pressure of a gas.
Heat:
1. Define temperature and heat.
2. Apply the concept of specific heat to describe temperature changes in various substances.
3. Apply a conceptual model to explain thermal expansion processes.
4. Apply the concepts of convection, conduction, and radiation to explain common processes involving heat transfer.
5. Apply a conceptual model to explain phase changes.
6. Explain the laws of thermodynamics and entropy.
7. Describe heat engines and explain their limited efficiencies.
Sound:
1. Describe the properties of waves in terms of frequency, wavelength and amplitude.
2. Describe the difference between transverse and longitudinal waves.
3. Describe the concept of interference.
4. Apply the concept of the Doppler effect to explain the change in pitch of a sound wave due to the motion of the observer or the source.
5. Apply a conceptual model that explains the variation of the speed of sound due to materials or temperature variations.
6. Apply the concept of interference to explain standing waves and common phenomena involving standing waves.
7. Apply the concept of interference to explain phenomena such as beats.
Electricity and Magnetism:
1. Apply Coulomb's law to describe how the electric force varies with distance and charge.
2. Explain the difference between an insulator and a conductor.
3. Explain the concept of the electric field and compare it to the gravitational field.
4. Describe electric potential and the electrical potential difference.
5. Describe the concepts of current and resistance.
6. Apply Ohm's law to explain the behavior of series and parallel electric circuits.
7. Describe the magnetic field, its sources and compare it to the electric field.
8. Explain the magnetic force on a moving particle.
9. Apply Faraday's Law to explain common phenomena involving induced electromagnetic fields.
Light:
1. Explain the wave nature of light.
2. Describe the electromagnetic spectrum and color.
3. Describe by selective reflection and selective transmission, and scattering.
4. Describe color mixing for transmitted and reflected waves.
5. Apply items 3 and 4 to explain observed colors in the sky.
6. Describe and explain the laws of reflection and refraction.
7. Apply the law of reflection to explain image formation with mirrors.
8. Apply the law of refraction to explain image formation with lenses.
9. Apply the laws of reflection and refraction to explain commonly observed phenomena in our daily lives (e.g rainbows, mirages, corrective lenses, telescopes etc).
10. Apply interference to explain commonly observed phenomena in our daily lives.
11. Define polarization and use it to explain commonly observed phenomena or commonly used items in our daily lives.
12. Apply the atomic theory of matter to explain the stimulated emission of light and lasers.
13. Apply the particle theory of light to explain the photoelectric effect.

14. Describe wave/particle duality and its implications on our understanding of nature.
Atomic and Nuclear Physics:
1. Describe the Bohr model of the atom and use it to explain the shell model.
2. Describe the parts of the nucleus.
3. Describe radioactivity and explain the processes of alpha decay, beta decay, and gamma decay.
4. Explain nuclear fission and describe an example of this process (e.g. atomic bomb, nuclear reactors etc)
5. Explain nuclear fusion and describe an example of this process (e.g. hydrogen bomb, controlled thermonuclear fusion, stellar evolution etc)

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Physical Sciences
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B1 Physical Science
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
  - IGETC - 5A Physical Science

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Objective Examinations
  - Example: 1. A NEGATIVELY charged rod will _____ a stream of water. a. attract b repel c. neither attract or repel 2. When salt is added to ice, the temperature drops, since the salt a. interferes with freezing of water b. interferes with melting of ice c. is colder than the ice d. lowers the freezing point of water e. lowers the melting point of ice
- Problem Solving Examinations
  - Example: 1. If 100 volts AC are put across a 200-turn transformer primary, the voltage across the 1000-turn secondary will be _____ volts. a. 100 b. 200 c. 500 d. 1000 e. 20

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. A class or online multimedia presentation is used to discuss magnetic fields and forces. The presentation includes graphics and video clips for emphasis and clarity. The instructor includes numerous demonstrations throughout the lecture/discussion or online module. Students are encouraged to participate in the discussion with probing questions regarding the concepts with requests to participate in offering solutions to examples. Demonstrations are used to both illustrate principles and to challenge students' critical thinking skills. (Objectives: 7 and 8 in category Electricity and Magnetism)

Distance Learning

1. A class or online multimedia presentation is used to discuss the nucleus and its properties. The presentation includes graphics and video clips for emphasis and clarity. The instructor includes numerous live and video demonstrations throughout the lecture/discussion or online module. Students are encouraged to participate in the discussion (either in class or through a Discussion board for online students) with probing questions regarding the concepts with requests to participate in offering solutions to examples. Live demonstrations or online videos are used to both illustrate principles and to challenge students' critical thinking skills. (Objectives: 2 thru 5 in category Atomic and Nuclear Physics)

Typical Out of Class Assignments
Reading Assignments

1. Read the assigned chapter on "Newton's Second Law of Motion" and be prepared for a discussion. 2. Read the assigned chapter on "Light Waves" and be prepared for discussion.

Writing, Problem Solving or Performance

1. For Homework: Answer or solve selected questions or problems at the end of the chapter on force. For example: A stone is suspended at rest by a string. Draw the force vectors for all the forces that act on the stone. 2. Answer selected questions from the study guide, for example: Timmy Tommer is the town's top teeter totterer. He weighs 200 pounds. When he sits 4 feet from the pivot of a teeter totter, he exactly balances Sally Soupy, who is crying for no good reason and who weighs 80 pounds. How far from the pivot is silly sobbing Sally Soupy sitting? (Ans:10 feet)

Other (Term projects, research papers, portfolios, etc.)
Required Materials

- Conceptual Physics
  - Author: Hewitt
  - Publisher: Pearson
  - Publication Date: 2015
  - Text Edition: 12th
  - Classic Textbook?:
  - OER Link:
  - OER:
- How Things Work: The Physics of Everyday Life
  - Author: Bloomfield
  - Publisher: Wiley
  - Publication Date: 2015
  - Text Edition: 6th
  - Classic Textbook?:
  - OER Link:
  - OER:
- Inquiry into Physics
  - Author: Vern J. Ostdiek and Donald J. Bord
  - Publisher: Cengage
  - Publication Date: 2018
  - Text Edition: 8th
  - Classic Textbook?:

- OER Link:
- OER:

Other materials and-or supplies required of students that contribute to the cost of the course.