Las Positas College
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Course Outline for PHYS 10

DESCRIPTIVE PHYSICS

Effective: Fall 2018

I. CATALOG DESCRIPTION:
PHYS 10 — DESCRIPTIVE PHYSICS — 3.00 units

Motion, gravitation, heat, light, sound, electricity, magnetism, atoms, and nuclei. Present-day scientific problems and developments such as alternative energy sources, solar energy, nuclear power, lasers, relativity and black holes. Designed for non-majors in physical science.

3.00 Units Lecture

Prerequisite
MATH 107 - Pre-Algebra
with a minimum grade of C
or

MATH 107B - Pre-Algebra B
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:
- Physics/Astronomy

	MIN
Lecture Hours:	54.00
Expected Outside of Class Hours:	108.00
Total Hours:	162.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. MATH107
1. perform accurate computations with whole numbers, fractions and decimals, signed and unsigned, without using a calculator;
2. simplify and evaluate variable expressions;
3. demonstrate a knowledge of ratios, proportions and precentages and their application;
4. demonstrate knowledge of geometric figures and their properties;
5. demonstrate a knowledge of the English and metric units of length, area, volume, mass, temperature and time;
6. solve linear equations involving multiple steps;
7. analyze and construct graphs of data;
8. construct graphs of linear equations in two variables in a rectangular coordinate system;
9. calculate mean, median and mode from a set of data;
10. apply the concepts learned to specific real-life applications, such as, simple interest, business and finance, restaurants, bank statements, etc.

B. MATH107B

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Identify and describe fundamental concepts of mechanics, electricity and magnetism, thermal physics, optics, relativity, and modern physics.
B. Apply quantitative reasoning and logic to the solution of simple problems in mechanics, electricity and magnetism, thermal physics, optics, relativity, and modern physics.
C. Identify and describe the scientific contributions made by key individuals, such as Aristotle, Galileo, Newton, Maxwell and Einstein.
D. Explain the development of fundamental ideas in physics from a historical perspective.
E. Explain the importance of physical principles in shaping the global use of technology, as well as their effect on the environment and society.

V. CONTENT:

A. About Science
   1. Scientific Methods
   2. The Scientific Attitude
   3. Pseudoscience
   4. Science, Art, And Religion
   5. Science And Technology
   6. Physics: The Basic Science

B. Atoms
   1. The Atomic Hypothesis
   2. Atomic Structure
   3. The Elements
   4. Periodic Table of The Elements
   5. Relative Sizes of Atoms
   6. Isotopes
   7. Molecules
   8. Atoms and Subatomic Particles

C. Equilibrium and Linear Motion
   1. Aristotle On Motion
   2. Inertia
   3. Mass and Weight
   4. Net Force
   5. Equilibrium
   6. Friction
   7. Speed vs. Velocity
   8. Acceleration

D. Newton's Laws of Motion
   1. Newton's First Law Of Motion
   2. Newton's Second Law Of Motion
   3. Newton's Third Law Of Motion
   4. Vectors

E. Momentum and Energy
   1. Momentum
   2. Impulse
   3. Conservation of Momentum
   4. Collisions

F. Energy
   1. Work
   2. Conservation of Energy
   3. Power
   4. Simple machines
   5. Efficiency

G. Gravity, Projectiles, and Satellites
   1. The Universal Law of Gravity
   2. Gravity and Distance: The Inverse-Square Law
   3. Weight and Weightlessness
   4. Projectile Motion
   5. Satellites and Orbits
   6. Escape Speed

H. Fluid Mechanics
   1. Density
   2. Pressure
   3. Buoyancy
   4. Archimedes' Principle
   5. Pascal's Principle
   6. Bernoulli's Principle

I. Thermodynamics
   1. Temperature and Absolute Zero
   2. Internal Energy
   3. Heat
   4. The Laws of Thermodynamics
   5. Entropy
   6. Heat Capacity
   7. Thermal Expansion

J. Heat Transfer and Phase Changes
   1. Conduction
   2. Convection
   3. Radiation
   4. Newton's Law of Cooling
   5. Global Warming and the Greenhouse Effect
   6. Phase Changes

K. Electricity
   1. Static Electricity
   2. Electric Force and Charge
   3. Coulomb's Law
   4. Electric Field
   5. Electric Potential
   6. Voltage Sources
   7. Electric Current
   8. Electric Resistance
   9. Ohm's Law
   10. Electric Circuits
   11. Electric Power

L. Magnetism
   1. Magnetic Fields
   2. Electromagnets
   3. Magnetic Forces on Moving Charges
   4. Electric Motors

M. Electromagnetic Induction

1. Faraday's Law
2. Generators and Alternating Current
3. Power Production and Transformers

N. Waves and Sound
1. Vibrations and Waves
2. Wave Motion
3. Transverse and Longitudinal Waves
4. Sound Waves
5. Reflection and Refraction of Sound
6. Forced Vibrations and Resonance
7. Interference
8. Beats
9. Standing Waves
10. Doppler Effect
11. Musical Sounds

O. Light and Optics
1. Electromagnetic Spectrum
2. Transparent and Opaque Materials
3. Color
4. Diffraction
5. Interference of Light
6. Reflection
7. Refraction
8. Dispersion
9. Total Internal Reflection
10. Lenses
11. Polarization

P. Quantum Theory
1. The Photoelectric Effect
2. Emission Spectra
3. Absorption Spectra
4. Blackbody radiation
5. Lasers
6. Wave-Particle Duality
7. Uncertainty Principle

Q. The Atomic Nucleus and Radioactivity
1. Radioactivity
2. Alpha, Beta, and Gamma Rays
3. Radiometric Dating
4. Environmental Radiation
5. The Atomic Nucleus and the Strong Force
6. Fusion and Fission
7. Mass-Energy Equivalence

R. Relativity
1. Special Relativity
2. General Relativity

VI. METHODS OF INSTRUCTION:

A. **Discussion** -
B. **Field Trips** -
C. **Classroom Activity** - Individual and group skill building activities (may include problem worksheets, hands-on experimentation, movies, and/or computer simulations)
D. **Lecture** -
E. **Simulations** -
F. **Demonstration** -

VII. TYPICAL ASSIGNMENTS:

A. weekly or biweekly textbook readings
B. weekly or biweekly take-home quizzes
C. weekly or biweekly homework problems
D. special topic projects

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Papers
4. Projects
5. Group Projects
6. Class Participation
7. Class Work
8. Home Work

B. **Frequency**

1. Quizzes may be given weekly or at the discretion of the instructor.
2. Exams may be given 4 times per semester, or at the discretion of the instructor.
3. A research paper may be turned in once per semester, or at the discretion of the instructor.
4. A group project may be assigned once per semester, or at the discretion of the instructor.
5. Class participation may be evaluated during every class, or at the discretion of the instructor.
6. Homework and class work may be assigned weekly, or at the discretion of the instructor.

IX. TYPICAL TEXTS:

1. Hewitt, Paul. *Conceptual Physics.* 12th ed., Pearson, 2015.
2. Griffith, W., and Juliet Brosing. *Physics of Everyday Phenomena.* 8th ed., McGraw-Hill Education, 2015.
3. Muller, Richard. *Physics and Technology for Future Presidents.* 1st ed., Princeton University Press, 2010.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. A basic scientific calculator and computer access may be required for this course.