Las Positas College
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Course Outline for PHYS 10

DESCRIPTIVE PHYSICS

Effective: Fall 2019

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 55 - Intermediate Algebra for STEM
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. MATH55
1. Recognize and determine the distinctions between relations and functions, numerically, graphically, symbolically, and verbally;
2. Solve polynomial, rational, absolute value, radical, linear, exponential, and logarithmic equations;
3. Apply basic operations on functions, including composition of functions and finding inverse functions;
4. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions. Topics should minimally include growth, decay, geometry, optimization and uniform motion.
5. Use the properties of radicals, complex numbers, exponents and logarithms;
6. Sketch the graphs of nonlinear relations, including parabolas and circles, and identify key components of the graphs;

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:

Methods/Frequency

A. Exams/Tests
at least one midterm and a final exam
B. Quizzes
minimum of five
C. Research Projects
one
D. Group Projects
at instructors discression
E. Class Participation
daily
F. Class Work
bi-weekly
G. Home Work
weekly

IX. TYPICAL TEXTS:

1. Muller, Richard. *Physics and Technology for Future Presidents.* 1st ed., Princeton University Press, 2010.
2. Hewitt, Paul. *Conceptual Physics.* 12th ed., Pearson, 2015.
3. Griffith, W, and Juliet Brosing. *Physics of Everyday Phenomena.* 9th ed., McGraw-Hill, 2019.
4. Ostdiek, Vern, and Donald Bord. *Inquiry Into Physics.* 8th ed., Cengage, 2018.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

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