Las Positas College
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Course Outline for PHYS 10

DESCRIPTIVE PHYSICS

Effective: Fall

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

Strongly Recommended
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or

MATH 107 - Pre-Algebra

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	54.00
Total Hours:	54.00

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

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering this course, it is strongly recommended that the student should be able to:

A. MATH107

IV. MEASURABLE OBJECTIVES:

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

1. identify and describe fundamental concepts of mechanics, electricity and magnetism, thermal physics, optics, relativity, and modern physics,
2. apply critical reasoning and logic to the solution of simple problems in mechanics, electricity and magnetism, thermal physics, optics, relativity, and modern physics;
3. identify and describe the contributions to field of physics made by key individuals, such as Aristotle, Galileo, Newton, Maxwell and Einstein;
4. understand the historical perspective and development of great ideas in the history of physics;
5. appreciate 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. Pre-Newtonian physical concepts and development of scientific method. Rationalist and pre-rationalist view of the universe, motion, and phenomenology. The Aristotelian world view. The role of the religion in defining scientific discourse. Copernicus, the Inquisition, and Galileo's role in overturning the geocentric model of the cosmos. Galileo's experimental approach and attempts to explain the basis of motion on earth and in the heavens.
B. The study of Motion: Motion in one dimension. Constant and instantaneous speed, velocity, and acceleration. Free fall and projectile motion. Circular motion and centripetal acceleration. Orbital motion and satellites.
C. Newtonian Mechanics: Newton's contributions to Physics, including the concepts of inertia, mass, and force. Relationship between mass and weight. Relationships between force, mass, and acceleration. Applications of Newton's laws in understanding the behavior of familiar objects (i.e., automobiles). Amusement park physics. Moments of inertia, torque, and angular motion.
D. Conservation Principles: Definitions of momentum and energy. Energy and momentum conservation. Definition and conservation of angular momentum applications to familiar situations, as well as orbital mechanics.
E. Heat, Kinetic Theory, and Entropy Behavior of gasses. Relationships between temperature, pressure, and volume. Relationship between temperature and kinetic energy. Principles of heat transport. Applications of thermal principles to familiar problems in heating and insulation. The three laws of thermodynamics. Relationship between heat, temperature, and disorder. Methods of energy

production, including solar, nuclear, and fossil fuel. Environmental effects of energy production methods. Physiological applications, including mechanical efficiency, and calorie requirements.
F. Wave Motion: Sound waves, interference, musical sounds, harmonics, and resonance.
G. Electricity and Magnetism: Electric forces and fields, magnetic forces and fields. Electric potential. Direct and alternating current circuits. Electromagnetic Induction. Faraday's contributions. Maxwell's equations.
H. Electromagnetic spectrum. Traveling electromagnetic waves. Production and detection of electromagnetic waves. Relationship between speed, frequency, and wavelength. Reflection, refraction, and dispersions. Interference of light waves. Principles of cameras, telescopes, and microscopes. The human eye.
I. Principle(s) of Relativity: Measurement of the speed of light. The Michaelson Morely experiment and the search for the "Ether." Albert Einstein and principle of special relativity. Cosmic rays. General relativity and black holes.
J. Quantum Mechanics: Plank's hypothesis. The DeBroglie Model. The wave particle duality. Atomic theory. Nuclear physics.
K. Recent developments in physics particle physics and the standard model. The search for a new theory of the universe. Cosmology and the Big Bang.

VI. METHODS OF INSTRUCTION:
A. **Lecture** - (may include demonstrations and computer-based simulations)
B. Individual and group skill building activities (may include problem worksheets, hands-on experimentation, movies, and/or computer simulations)
C. **Field Trips** - (may include scheduled field trips to off-campus locations, such as Stanford Linear Accelerator, and "virtual field trips" to World Wide Web sites designed to provide an educational look at a real site of interest in the world of physics research and industry
D. World Wide Web sites
E. **Discussion** -
F. Problem solving

VII. TYPICAL ASSIGNMENTS:
A. Reading 1. Read Chapter 2 from Conceptual Physics and do "Next Time" problems 1, 2, 5, 7, 9. Use concepts from the chapter to answer these problems. 2. Access the SLAC "Virtual Visitor's Center" page from the World Wide Web as provided in the syllabus. Take the "Virtual Tour" while jotting down a list of at least ten questions regarding terms, concepts, or ideas that you either don't understand or wish to discuss further. B. Writing, problem solving or performance: 1. Read Chapter 4 in Conceptual Physics and answer problems 3, 5, 7, 9, 35, 40, 45 and 51. 2. Explore the NASA WWW site on the "International Space Station" as discussed in the syllabus. Write a one-page summary of the site, emphasizing the following topics: the orbit of the space station, its orbital period, why or why not artificial gravity will be provided for its inhabitants, its mass, the methods used to assemble it, and its scientific purposes once completed. 3. Other work: a. Run the "Kepler's third law simulation" linked to the syllabus on the VIWW. Write one paragraph describing the activity, and answer the questions posed during the simulation. Compare your answers to those of your activity group. Discuss the differences between your answers, if any. b. In the guide "Practicing Conceptual Physics," perform the scheduled activity or experiment, and describe your results in the space provided. Compare your results to those of your activity group. Submit one “write-up” per group discussing your experiences and the reasons underlying the differences and similarities in your experiences. c. View the "Single and double slit diffraction" activity on the "Physics 2000 website,” listed in the class resource web page and use the results of this investigation to help you answer the questions on the “interference of light waves” activity sheet.

VIII. EVALUATION:
A. **Methods**
1. Quizzes
2. Papers
B. **Frequency**
1. Frequency of Evaluation:
a. One quiz every two to four weeks (4-8 per semester)
b. One research paper
c. Weekly or bi-weekly skill building activities
d. One midterm exams
e. One final examination

IX. TYPICAL TEXTS:
1. Hewitt, Paul *Conceptual Physics.* latest Edition. ed., -, 0.
2. Hewitt, Paul *Activities for Conceptual Physics.* latest Edition. ed., -, 0.

X. OTHER MATERIALS REQUIRED OF STUDENTS: