Crafton Hills College
Course Outline

1. **Discipline:** Physics

2. **Department:** Physical Science/Mathematics

3. **Course Title:** Introduction to Physics

4. **Course I.D:** PHYSIC 100

5. **Prerequisite(s):** None

   Corequisite(s): None

   Departmental Recommendation(s): None

6. **Semester Units:** 4

7. **Minimum Semester Hours:**

   Lecture: 48 Lab: 48 Clinic: 0 Field: 0

8. **Need for the Course:**

   Many students require the ability to apply physical concepts to problems and situations in their major fields of study but do not require the mathematical rigor used in PHYSIC 110-111 and/or PHYSIC 200-201. PHYSIC 100 is applicable to and fulfills the natural science general education requirement for an associate degree. This course transfers to CSU and transfers to UC if not taken after PHYSIC 110-111 or 200-201. This course fulfills a CSU general education requirement in area B1, Physical Science with a laboratory and an IGETC requirement in area 5, Physical Science with a laboratory.

9. **Goals for the Course:**

   The course will provide the student with the ability to recognize basic physical principles and to apply those principles to predict the outcome of physical events.

10. **Catalog Description:**

    Introduction to the ideas, concepts, and theories of physics including mechanics, waves, heat, electromagnetism, and atomic and nuclear structure. This course does not require students to have extensive knowledge of mathematics.

11. **Schedule Description:**

    Introduction to the ideas, concepts, and theories of physics including mechanics, waves, heat, electromagnetism, and atomic and nuclear structure. This course does not require students to have extensive knowledge of mathematics.

12. **Entrance Skills:**

    A. **Requisite Skills:** None

    B. **Recommended Skills:** None

13. Course Objectives:

Upon satisfactory completion of the course, students will be able to:

A. Describe motion appropriately using the terms velocity, speed, and acceleration correctly.
B. Complete an experiment measuring length and time to determine velocity and acceleration.
C. Recognize the principles of Newton's three Laws of Motion at work in actual cases of motion and use them to predict motion in simplified and real problems. Complete an experiment demonstrating the relation between force, mass and acceleration.
D. Use the concept of momentum conservation to predict the outcome of collisions and use the concepts of momentum and impulse to analyze the forces involved in collisions and other rapid events, conceptually and through experimentation.
E. Identify and measure the different forms of energy present during various processes and to identify the forms of energy that are available for use through energy transformations.
F. Use the concepts of torque, rotational inertia and angular momentum to predict when rotation will occur and the nature of that rotation.
G. Predict changes in gravity created by changing the masses or distances involved in the gravitational force.
H. Combine the concept of inertia and gravitational force to explain orbits and to predict what will happen when velocities are too high or too low.
I. Explain the role of protons, neutrons and electrons in the basic structure of atoms and molecules.
J. Recognize the different states of matter (solid, liquid and gas) and explain what is happening in each phase to atoms and molecules.
K. Use the motion of molecules to predict the behavior of gases as pressure, temperature and volume change.
L. Use the concepts of kinetic and potential energy of molecules to explain and measure various aspects of heat including heat transfer, heat storage and phase changes.
M. Use the basics of wave behavior (reflection, refraction, diffraction and interference) to predict the behavior of water, sound and light waves.
N. Relate wavelength, frequency, and wave velocity.
O. Explain the nature of electric current and use Ohm's Law to predict and measure voltage, current and resistance in simple electric circuits.
P. Explain how magnetic forces and fields arise in permanent and electromagnets.
Q. Use the concept of electromagnetic induction to predict the motion in an electric motor and the induced voltage in a generator.
R. Distinguish between AC and DC and explain why AC is used in power distribution systems.
S. Conduct experiments measuring reflection, refraction and the images formed by lenses and mirrors.
T. Explain how quantum mechanics differs from classical mechanics, and use this knowledge to explain the structure of the atom as well as the nature of light emitted by atoms.
U. Use the concept of quantum mechanics to explain the structure of the nucleus and types of radioactive decay.
V. Use the concepts of energy, mass and charge to predict the danger posed by different types of radioactive decay.
W. Predict the changes expected as objects travel close to the speed of light using the concepts of special relativity.
X. Write a well-structured lab report, discussing physics principles as outlined in the lab handout.

14. Representative Texts and Instructional Materials:

Hewitt, P. (2006). *Conceptual Physics* (10/e). San Francisco, CA: Addison-Wesley.

Kirkpatrick, L. & Francis, G. (2004) *Physics – A World View* (5/e). Stamford, CT: Thomson Learning.

Departmentally developed handouts outlining laboratory experiments.

15. Course Content:

A. Mechanics
   1. Definition of velocity, speed, and acceleration
   2. Two-dimensional motion
   3. Newton's Laws of Motion
   4. Momentum conservation and impulse
   5. Energy
   6. Rotational motion
   7. Gravity

B. Structure of Matter
   1. Basic structure of atoms and molecules
   2. Types of solids
   3. Fluids
      a. Pressure and fluid statics
      b. Buoyant force
      c. Bernoulli's Principle
      d. Gas Laws

C. Thermodynamics
   1. Expansion
   2. Specific heat
   3. Heat transfer
   4. Phase changes
   5. Entropy

D. Waves

E. Electromagnetism
   1. Electrostatics
      a. Electric force
      b. Electric field
      c. Electric potential and potential energy
   2. Currents
      a. Ohm's Law
      b. Series and parallel circuits
      c. Electric shock
      d. Electric circuits
   3. Electromagnetic induction
      a. Magnetic fields
      b. Motors and generators
      c. Transformers

F. Optics
   1. Reflection and refraction
   2. Lenses and mirrors (geometric optics)
   3. Diffraction and interference
   4. Lasers and holograms

G. Quantum mechanics
   1. Wave-particle duality
   2. Wave function and probability
   3. Structure of the atom

4. Atomic spectra
5. Structure of the nucleus
6. Radioactivity
7. Nuclear reactions

H. Special Relativity
1. Time dilation and twin paradox
2. Lorentz contraction
3. Mass increase
4. Mass-energy relation

16. Methods of Instruction:

This course will combine lecture, demonstration, reading, class discussion & participation, and laboratory experiments. The course is conceptually based, requiring no mathematical preparation at the college level. The laboratory will require arithmetic calculation using addition, subtraction, multiplication and division. The use of calculators is appropriate for the laboratory, but unnecessary for the remainder of the course.

17. Assignments and Methods of Evaluation:

A.	Participation:	0 – 10%
B.	Homework:	0 – 20%
C.	Quizzes:	0 – 50%
D.	Exams including a required final examination:	10 – 40%
E.	Laboratory including laboratory reports:	25%

18. Distributed Education Methods of Instruction: None