PHSC G100: INTRODUCTORY PHYSICAL SCIENCE

Item	Value
Curriculum Committee Approval Date	11/05/2019
Top Code	190100 - Physical Sciences, General
Units	4 Total Units
Hours	108 Total Hours (Lecture Hours 54; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)
Local General Education (GE)	• GWC Physical Universe*** (GB1)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5A Physical Science (5A) • Cal-GETC 5C Laboratory Activity (5C)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5A Physical Science (5A) • IGETC 5C Laboratory Activity (5C)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B1 Physical Science (B1) • CSU B3 Laboratory Activity (B3)

Course Description

This course provides an introductory level coverage of the physical sciences, including physics, chemistry, geology, the atmosphere and astronomy. Emphasis is placed on applications of the laws of physical science. A background in the physical sciences is developed starting with physics and chemistry, followed by the application of these fields to the study of geology and meteorology, and finally, to the solar system and universe. Appropriate laboratory activities and mathematical calculations will reinforce the physical, chemical and geological concepts. Transfer Credit: CSU; UC: Credit Limitation: No credit if taken after a college level course in Astronomy, Chemistry, Geology, or Physics.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Identify important discoveries in the fields of physics, chemistry, geology, and astronomy.
3. Explain the underlying principles that govern the behavior of matter and energy.
4. Demonstrate understanding of basic concepts dealing with chemical reactions.
5. Explain various physical phenomena through the use of appropriate laboratory equipment.

Course Objectives

- 1. Recall the scientific method and demonstrate its application to phenomena in the physical sciences.
- 2. Explain the concepts of velocity, acceleration, inertia, and net force and use Newtons laws of motion to predict the motion of objects.
- 3. Explain the concepts of momentum, work, and energy, including kinetic and potential energies, and solve for physical quantities using the principle of conservation of energy.
- 4. State Newtons law of gravity and use it to predict the motion of objects under the influence of gravity, with particular emphasis on projectile and satellite motion.
- 5. Define density and pressure and demonstrate the calculation of these quantities using the gas laws.
- 6. Define thermal energy, describe heat transfer, calculate the energy required for changes of state, and recall the consequences of the first and second laws of thermodynamics.
- 7. Recall the types of electrical charges and magnetic poles, predict the actions of electric and magnetic forces, and explain the operation of simple electrical circuits.
- 8. Explain the basic properties of waves and relate them to the nature of light.
- 9. Describe the composition of matter according to the atomic theory and summarize the periodic properties of the elements using the periodic table.
- 10. Explain the difference between ionic and covalent bonds and predict the type of bond that results when two elements combine to form a chemical compound.
- 11. Describe the important types of chemical reactions, calculate the amounts of reactants and products in a chemical reaction, describe chemical equilibrium and predict how it changes in response external stresses, and explain how the rate of a chemical reaction can be altered.
- 12. Differentiate the properties of liquids, solids, and solutions and explain the different atomic-level origins of their properties.
- 13. State the layers of the atmosphere and describe how wind and temperature influence weather.
- 14. Explain the source of the earths seasons and describe how wind and temperature influence weather.
- 15. State the elements that compose the earths crust, recall the properties of common minerals, and list the classes of rocks and their origins.
- 16. Explain the processes at work in the interior of the earth: plate tectonics, earthquakes, and vulcanism.
- 17. Identify and illustrate the processes at work on the surface of the earth: weathering, erosion, and sedimentation.
- 18. Describe the evolution of the earth based on plate tectonics and the fossil record.
- 19. Model the members of the solar system and describe their important features.
- 20. State and describe the main features of the universe and explain the experimental equipment used to observe them.

Lecture Content

The Nature of Science The Scientific Method Applications of the Scientific Method Limitations of the Scientific Method The Physical Sciences Physics Motion and Equilibrium Velocity and Acceleration

Inertia Net Force Newtons Laws of Motion Momentum and Energy Work and Conservation of Energy Potential Energy Kinetic Energy Newtons Law of Universal Gravitation Projectile and Satellite Motion Fluid Mechanics Thermal Energy and Thermodynamics Heat Transfer and Phase Changes Electricity and Magnetism Light and Waves Chemistry The Atom and Nucleus The Periodic Law Molecular Attractions Chemical Reactions Kinetics Equilibrium Acids and Bases Oxidation and Reduction Liquids, Solids, and Solutions Meteorology The Atmosphere Weather Climate Geology Earth Materials Minerals and Mineral Resources Rocks Interior Processes Plate Tectonics Earthquakes and Earths Interior Vulcanism Surface Processes Weathering and Erosion Surface Features and Deposits Earth History Fossil Record Evolution and Geologic Time Astronomy Earth-Moon System Solar System Stars Universe Galaxies Cosmology

Lab Content

Physics Computer Simulations Physics of Motion Linear Motion Graphical representation of data Velocity Acceleration Conservation of Energy Waves Hands-On Experiment Circuits Ohms Law Chemistry Calorimetry Temperature of a Bunsen burner flame Atomic Line Spectrum Interpretation of experimental results Organic Chemistry Building models of isomers and examples of functional groups Types of Chemical Reactions Geology Mineral Kits Properties of Minerals Crystalline Structures Earthquake Seismograms Location Magnitude Meteorology Greenhouse Gases Internet Research Energy Consumption Economic Impact Astronomy Hubble Constant Distance to the Moon

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

Reading Assignments

1. Chapters from the textbook 2. Laboratory exercises (introduction and instructions)

Writing Assignments

1. Write explanations to questions asked as part of laboratory exercises.
2. Write answers to questions assigned from the textbook.

Out-of-class Assignments

Optional assignments may be given to students to research and write papers on topics of current interest.

Demonstration of Critical Thinking

Critical thinking and problem solving are primarily required in two ways: one, problems are assigned from the textbook that require students to use principles and equations covered in the lectures in ways different than those previously seen and, two, laboratory exercises require students to collect and review data, draw conclusions from data, and compare their conclusions to accepted standards.

Required Writing, Problem Solving, Skills Demonstration

Students will be required to, one, write explanations to questions asked as part of their laboratory exercises and, two, write answers to questions assigned from the textbook.

Eligible Disciplines

Chemistry: Masters degree in chemistry OR bachelors degree in chemistry or biochemistry AND masters degree in biochemistry, chemical engineering, chemical physics, physics, molecular biology, or geochemistry OR the equivalent. Masters degree required. Earth science: Masters degree in geology, geophysics, earth sciences, meteorology, oceanography, or paleontology OR bachelors degree in geology AND masters degree in geography, physics, or geochemistry OR the equivalent. Masters degree required. Physics/Astronomy: Masters degree in physics, astronomy, or astrophysics OR bachelors degree in physics or astronomy AND masters degree in engineering, mathematics, meteorology, or geophysics OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Kranskopf, K., and Beiser, A.. The Physical Universe, 16th ed. McGraw Hill, 2017 2. Required GWC Faculty. Introductory Physical Science Lab Manual, 1 ed. Golden West College, 2019

Other Resources

1. Various computer simulations at https://phet.colorado.edu/ are used in the course.