MiraCosta College

PHSN 101 - FUNDAMENTALS OF PHYSICAL SCIENCE

Units Lecture	3.00	**Units Lab**	0.00	**Units Total**	3.00
Total Hrs Lecture	49.50	**Total Hrs Lab**	0.00	**Total Course Hrs**	49.50

COURSE DESCRIPTION

This physical science survey course includes astronomy, geology, physics, and chemistry. It emphasizes an understanding of the fundamental principles, procedures, and methods in science. UC CREDIT LIMITATION: No credit if taken after college course in Astronomy, Chemistry, Geology, or Physics.

ENROLLMENT RESTRICTIONS

PREREQUISITES	***COREQUISITES***	***ADVISORIES***

OUTLINE OF COURSE CONTENT

The course will address the following topics:

I. Scientific method
A. Process and terms
B. Controlled experiments
C. Measurements and units
D. Scientific reasoning
E. Scientific notation.

II. Physics
A. Mechanics
1. Motion: speed, velocity, and acceleration
2. Newton's laws: force, momentum, and gravity.
B. Energy
1. Types of energy
2. Kinetic and potential energy
3. Work
4. First law of thermodynamics
5. Thermal energy/heat/modes of heat transfer
6. Entropy and second law of thermodynamics.
C. Electricity and magnetism
1. Fields
2. Ohm's law and circuits
3. Ferromagnetism
4. Electromagnetic induction.
E. Nuclear structure and processes
1. Subatomic particles
2. Radioactive decay
3. Nuclear reactions.

III. Chemistry
A. Properties of matter
1. States
2. Classification: substances and mixtures.
B. Atomic theory and structure
1. Nuclear atom
2. Electron shells
3. Periodic Table and electronic structure.

C. Chemical compounds and reactions
1. Bonding and types of compounds
2. Reactions
3. Solutions: acids and bases.

IV. Astronomy
A. Solar system
1. Earth
2. Earth and Moon
3. Development of the Copernican model
4. Seasons, eclipses.
B. Stars, life cycles of stars
C. The universe
1. Big Bang theory, cosmology
2. Galaxies.

V. Earth science
A. Geology
1. Plate tectonics
2. Rocks and minerals
3. Rock cycle
4. Volcanoes and earthquakes.
B. Atmosphere
1. Climate
2. Meteorology
3. Hydrologic cycle.

PERFORMANCE OBJECTIVES

Upon successful completion of this course, students will be able to do the following:

1). Use the scientific method and scientific reasoning to describe how controlled experiments are designed and carried out, to identify independent and dependent variables and describe correlations between them for given data sets and/or graphs, and to solve problems and perform calculations involving equations relating to physical and chemical quantities (i.e., force, acceleration, energy, electrical forces and circuits, and waves), scientific notation, measurements, and units
2). Explain how energy, work, heat, etc., are transferred and transformed in both natural phenomena (sunlight heating the earth) and artificial phenomena (a hair dryer converting electrical energy to heat to dry hair)
3). Explain how the fundamental forces of the universe (gravity, electromagnetism, strong force, and weak force) interact with matter to create motion, the transfer and transformation of energy, the properties of chemical elements and compounds, chemical bonding, chemical reactions, nuclear reactions, etc.
4). Analyze a given physical or chemical system to identify and describe the forces acting on a material object and to explain how the forces affect the motion and energy of the object, based on Newton's laws of motion and universal gravitation
5). Analyze a given physical or chemical system to identify and describe the energy transformations, including changes in entropy, involved in various processes based on the first and second laws of thermodynamics
6). Analyze a given physical or chemical system to identify, describe, and explain the electrical and/or magnetic forces and energy involved in examples of electrical circuits, ferromagnetism, and electromagnetic induction
7). Analyze a given physical or chemical system to identify, describe, and explain how the component particles and forces of the atoms of a given element determine the properties of that element, including electronic structure and periodic properties of elements, how the atoms interact with electromagnetic radiation, types of bonding and properties of compounds the atoms will form, chemical reactions of substances containing the atoms, etc.
8). Analyze a given physical or chemical system to identify, describe, and explain how the component particles and forces of an atomic nucleus of a given isotope determine the types of radioactive decay and other nuclear processes it undergoes
9). Apply the principles of physics and chemistry to the explanation of the processes involved in formation of stars and planets from interstellar dust and gas as well as to the description and explanation of the life cycles of stars and the properties of the various types of planets

10). Explain how the evidence from cosmology demonstrates that the universe originated in the Big Bang
11). Explain how the evidence from geology demonstrates that the features and phenomena apparent at the Earth's surface are caused by the actions of the internal structure of the Earth as described in the theory of plate tectonics
12). Analyze a given geological system to determine and identify the types of rocks present and explain how the rocks were produced, according to the rock cycle
13). Apply the principles of physics and chemistry to describe and explain the processes that take place in Earth's atmosphere and hydrosphere, including weather and the water cycle.

READING ASSIGNMENTS

Reading assignments will be consistent with, but not limited by, the following types and examples:

1). Read textbook sections that deal with content topics
2). Read articles in science periodicals and books and published on the Internet to complete individual and group research projects
3). Examine and analyze arguments and explanations published in both print media (newspapers, books, magazine articles, etc.) and digital media concerning topics of interest involving physical and chemical principles, and assess the validity of the conclusions expressed.

WRITING ASSIGNMENTS

Writing assignments will be consistent with, but not limited by, the following types and examples:

1). Construct and write cause and effect arguments and explanations, applying physical and chemical concepts to common phenomena, such as the following: explain how different types of energy are transferred and transformed in both natural and artificial phenomena
2). Prepare a research paper about a physical or chemical system that is of concern to contemporary society, such as concerns about nuclear reactions or radioactive decay
3). Write a group research paper based on a particular topic or set of related topics covered in class
4). Analyze arguments and explanations published in both print and digital media concerning topics of interest involving physical and chemical principles and prepare a written assessment of the conclusions expressed.

OUTSIDE-OF-CLASS ASSIGNMENTS (READING/WRITING/OTHER)

Outside-of-class assignments will be consistent with, but not limited by, the following types and examples:

1). Complete reading assignments to prepare for class and for individual and/or group projects
2). Organize, assemble, and evaluate information from a number of sources (including both print and Internet sources), and use this information to produce either a thesis paper and/or a group project
3). Complete calculations and other quantitative and qualitative problem-solving assignments
4). Complete assignments given for each chapter covered in the textbook
5). Prepare essays, group projects and presentations, and individual research paper
6). Work in a group to discuss and analyze phenomena and to solve problems involving physical, chemical astronomical and geological principles.

STUDENT LEARNING OUTCOMES

	Learning Outcome	*Mode of Assessment*
1.	Students will analyze experimental data to determine correlations between independent and dependent variables, and construct reasonable cause and effect explanations for the correlations in an experimental data set, where appropriate, based on the concepts of physics, chemistry, earth science and/or astronomy, as appropriate.	1. Written essay problem on exam. Students will be given a table of experimental data involving at least two variables, and instructed to: 1) identify the independent and dependent variables; 2) determine whether there is a correlation between any of the independent variables and any of the dependent variables; 3) describe the correlations, if any, in words, and explain how they identified whether or not the variables are correlated; and 4) construct and write a cause and effect explanation of one or more of the correlations, as appropriate.
2.	Students will predict the basic chemical and physical properties of an element, based on its position on the	2. Written essay problem on exam. Students will be given a periodic table, and the name of a particular element,

	periodic table, and justify these predictions, in writing, based on the principles of atomic structure and periodic properties.	instructed to draw the electron shell diagram of the element. Students will also be instructed to predict one or more of its basic chemical and/or physical properties, and construct and write a cause and effect explanation of the predictions.
3.	Students will analyze a system of objects to determine the forces acting on the objects, predict the effects of these forces on the objects' motion, and explain these predictions using Newton's laws of motion and universal gravitation.	3. Written essay and diagram problem on exam. Students will be given a description of a physical system (objects, motion of objects, etc.) in written and/or diagram form, and instructed to identify all of the forces, including direction, acting on each object in the system. Students will also be instructed to predict and explain other properties of the system, such as changes in motion, energy, etc., as appropriate.
4.	Students will analyze a star's properties in order to predict and explain the steps in its life cycle, based on concepts from astronomy and physics (for example, Hertzsprung-Russell diagrams and nuclear fusion).	4. Written essay and diagram problem on exam. Students will be given a description of a star's properties (energy output, surface temperature, relative size, etc.) in written and/or diagram form, and instructed to predict the major steps in its life cycle. Students will also be instructed to construct and write a cause and effect explanation of these predictions.
5.	Students will analyze a tectonic plate boundary system in order to predict the type(s) of mountains that will form along the plate boundary, and to explain these predictions based on the concepts of plate tectonics and the structure of the Earth.	5. Written essay and diagram problem on exam. Students will be given a description of a tectonic plate boundary system in written and/or diagram form, and instructed to predict the type(s) of mountains that will form along it. Students will also be instructed to construct and write a cause and effect explanation of these predictions.

METHODS OF INSTRUCTION

Instructional methodologies will be consistent with, but not limited by, the following types or examples:

1). Lecture
2). Inquiry-based exercises
3). Group work: discussion, analysis of phenomena, presentation preparation, and completion of projects
4). Student presentations.

METHODS OF EVALUATION

Evaluation methodologies will be consistent with, but not limited by, the following types or examples:

1). Exams or tests including multiple choice, calculations, scientific reasoning, problem-solving and description, application, and explanation of concepts and phenomena covered in the content outline
2). Projects (such as individual and/or group research papers and group presentations)
3). Written homework, including calculations, scientific reasoning, problem-solving and description, application, and explanation of concepts and phenomena covered class
4). Quizzes.

REQUIRED TEXTBOOKS

Examples of typical textbooks for this course include the following:

1). Trefil, James, and Robert M. Hazen. The Sciences: An Integrated Approach. 6th ed., Wiley, 2009. ISBN: 978-0470118542
2). Shipman, James, Jerry D. Wilson, and Aaron Todd. An Introduction to Physical Science. 12th ed., Brooks Cole, 2009. ISBN: 978-0618935963
3). Krauskopf, Konrad, and Arthur Beiser. The Physical Universe. 13th ed., McGraw Hill, 2009. ISBN: 978-0073512129

OTHER REQUIRED INSTRUCTIONAL MATERIALS

1). Scientific calculator.

MiraCosta College

COURSE REPEATABILITY

Total Completions Allowed:
1

In Combination With: