

COURSE OUTLINE **General Physical Science**

Course Description

PS 100. General Physical Science. 5 hours credit. Prerequisite: High school Algebra or MA 060 with a C or better. This course will enable the student to gain a basic understanding of astronomy, meteorology, geology, chemistry and physics. There are three hours of lecture/presentation periods and three hours of laboratory time each week.

Course Relevance

The impact of physical science in everyday life is phenomenal. The ability to see science in action on the micro (molecular) and macro scale is necessary to develop a fuller knowledge and understanding of the world around us. Physical Science will enrich the students' appreciation of the world and help them better understand the studies of science and the scientific methods.

Required Materials

Shipman, J., Wilson, J., and Todd, A., (2009). *An introduction to physical science*. (12th ed.). Boston, MA: Houghton Mifflin.

Laboratory Manual available online in ANGEL

Online Materials:

Lab kit purchased from the BCC bookstore
Word processing software capable of creating RTF files
Graphical Analysis software (Excel) capable of saving graphs

Laboratory Experiments:

The following 12 laboratory experiments will be performed along with a minimum of 8 additional experiments chosen by the instructor. All experiments are taken from the departmental lab manual.

Bouncing, Graphing and Predicting	Determination of Density
Binocular Sky Viewing <u>or</u> Solar Viewing	Phases of the Moon <u>or</u> Scale Model of Solar System
Cooling Curve	Conductivity of Solutions
Fossils or Map Readings KS	Rock and Minerals
Relative Humidity and Dew Points	Seasons
Constant Speed	Specific Heat

Learning Outcomes

The intention is for the student to be able to:

1. Understand the scientific method in analyzing scientific materials.

2. Demonstrate basic math skills.
3. Read, discuss, and understand scientific materials.
4. Apply scientific reasoning to real world problems.

Learning PACT Skills that will be DEVELOPED and/or documented in this course

Through involvement in this course, the student will develop ability in the following PACT skill area(s):

Personal Development Skills

1. Personal management
 - Through the production of either an essay or questionnaire the student will reflect on his/her personal management skills.

Analytical Thinking Skills

1. Critical thinking
 - Through the production of various mathematical, graphical, experimental and written assignments, the student will demonstrate scientific reasoning.

Communication Skills

1. Creation and delivery of messages
 - Through a variety of methods using either the internet and/or computer the student will produce a lab report to express his/her finding for the phases of the moon.

Technology Skills

1. General computer use
 - Through the production of electronic-facilitated research, preparing graphs, and manipulation of data, the student will develop basic computer skills.

Major Summative Assessment Task(s)

These learning outcome(s) and the Learning PACT skill(s) will be demonstrated by

1. Completing the departmental comprehensive final.
2. Writing a research paper/project on the phases of the moon.

Course Content

- I. Skills/Competencies – Actions that are essential to achieve the course outcomes:
 - A. Apply basic mathematical concepts
 - B. Prepare a research paper or project
 - C. Prepare lab reports
- II. Themes – Key recurring concepts that run throughout this course:
 - A. Scientific method
 - B. Scientific reasoning
- III. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
 - A. The balance between the conceptual and mathematical models.
 - B. The cumulative nature of science and the world.
 - C. The cumulative influence of scientific discoveries and the subsequent application of the discoveries.
 - D. The balance between “wet” lab science and computer interfacing, collection, and analysis of data.

IV. Concepts – Key concepts that must be understood to address the issues:

- A. Mathematics
- B. Scientific method
- C. Scientific reasoning
- D. Scientific writing
- E. Scientific principles
- F. MLA writing format
- G. Word processing
- H. Excel spreadsheet
- I. Graphing

Learning Units - Lecture

- I. Demonstrate knowledge of the method, techniques and tools used in science
 - A. Describe the steps involved in the scientific method
 - B. Discuss the significance of the scientific method
 - C. Demonstrate competence in scientific measurements including:
 - 1. Significant figures and rounding
 - 2. Errors and uncertainty
 - 3. Area, volume, and density
 - D. Read and interpret graphs, construct graphs from data
 - E. Correctly use powers of ten notation
- II. Demonstrate knowledge of basic concepts in Astronomy.
 - A. Explain the meaning and significance of the concept of Universal Gravitation
 - B. Describe the structure of the solar system
 - C. Explain the motions of the objects in the solar system, including the earth-moon system
 - D. Keep a journal of the phases of the moon and write a moon-log report
 - E. Identify major characteristics of each of the planets
- III. Demonstrate knowledge of major principles of chemistry
 - A. Develop and use the concept of the conservation of mass
 - B. Describe the characteristics of the three states of matter and explain changes
 - C. Differentiate between elements, compounds, and mixtures
 - D. Describe the structure of the atom including protons, electrons, and neutrons
 - E. Use the Periodic Law and the Periodic chart to identify and describe:
 - 1. The classes of elements
 - 2. Chemical families
 - 3. Atomic characteristics
 - F. Build simple compounds using appropriate nomenclature
 - G. Balance and interpret simple chemical reactions.
- IV. Demonstrate knowledge of basic geological processes
 - A. Describe how the earth has been changed over time including:
 - 1. Geologic timeline
 - 2. Plate tectonics

3. Earthquakes
 4. Volcanic activity
 5. Mountain building
 6. Glaciation
- B. Differentiate between rocks and minerals
 - C. Describe the characteristics of the three main types of rocks
 - D. Explain the rock cycle
 - E. Discuss the origin and significance of fossils
- V. Demonstrate knowledge about meteorological phenomena
- A. Describe the causes of the seasons
 - B. Discuss the causes and effects of tornadoes/storms with an emphasis on safety
 - C. Describe the major components of a weather map
- VI. Demonstrate knowledge of the fundamental concepts of physics
- A. Explain the process of thermal interactions
 1. Describe and differentiate heat and temperature
 2. Measure temperature and make conversions using various scales
 3. Describe and use heating and cooling curves
 4. Explain thermal transfer properties as they relate to everyday activities
 - B. Apply the concepts of simple motion
 - C. Define linear motion
 - D. Graph data and use graphs in analyzing motion
 - E. Describe the motion of falling bodies and do mathematical calculations
 - F. Describe the process of simple projectile motion
 - G. Define and calculate kinetic, gravitational, potential and total energies
 - H. Explain some of the basic principles in electricity and magnetism
 - I. Describe static electricity and cite examples
 - J. Calculate the cost of appliances in the home in terms of electrical use
 - K. Show basic properties of circuits using batteries and bulbs
 - L. Describe qualitatively and quantitatively the properties of Ohm's Law
 - M. Describe magnetism and the properties of magnetic fields
- VII. Reference literature sources to gather and summarize information in a written research paper (moon log)

Learning Units - Laboratory

- I. Make observations and measurements, handle data, calculate results, and draw conclusions from observations and/or experimental data
- II. Communicate results through written laboratory reports
- III. Demonstrate safe work habits in the lab
- IV. Construct a graph and interpret graphical data

V. Use critical thinking to solve a variety of problems

Learning Activities

Independent and collaborative learning activities will be assigned within and outside the classroom and laboratory to achieve the intended course outcomes. Classroom discussion, lecture, and textbook reading assignments will also contribute to the learning process.

Grade Determination

Grade determination will be based on the research paper, tests, lab reports, and comprehensive final exam. Other methods such as quizzes and homework may be used at the discretion of the instructor. The moon log report, departmental final, and student self evaluation are department requirements.