BUTTE COLLEGE
COURSE OUTLINE

I. **CATALOG DESCRIPTION**

PSC 12 - Concepts in Physical Science **4 Unit(s)**

Prerequisite(s): MATH 108 or Math Level IV
Recommended Prep: Reading Level IV; English Level IV
Transfer Status: CSU/UC
51 hours Lecture
51 hours Lab

This course is an investigation of basic principles of physics and chemistry including matter, physical and chemical properties, energy, motion, light, atomic structure, bonding, solutions and chemical reactions. The inter-dependence of chemistry and physics will be emphasized. This course is intended for non-science majors. (C-ID PHYS 140).

II. **OBJECTIVES**

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

A. Describe the states of matter and associate phase changes.
B. Classify matter as elements, compounds, mixtures and describe properties of each.
C. Describe basic atomic structure including the fundamental particles and electron energy levels.
D. Explain the history and structure of the periodic table.
E. Explain and describe different ways atoms combine to form compounds.
F. Describe the motion of objects as related through the concepts of position, displacement, speed, velocity and acceleration.
G. Use Newton's Laws to predict and explain the motion of an object.
H. Discuss the type of energy present in a system and use conservation of energy to solve problems.
I. Explain the requirements for a complete circuit in terms of a model of electric charge.
J. Describe color perception based on the wave nature of light and its interactions.
K. Understand fundamentals of taking and recording measurements including measuring length, area, volume, mass, density, significant figures, converting between units and scientific notation. (Lab)
L. Practical applications to both the chemistry and physics lecture objectives. (Lab)
M. Drawing conclusions between data and results including constructing graphs and identifying relationships. (Lab)
N. Utilize scientific methodologies solving a problem.

III. **COURSE CONTENT**

A. **Unit Titles/Suggested Time Schedule**

Lecture

Topics	Hours
1. Measurement and Fundamental Properties • Fundamentals of measuring length, area, volume and mass • Density of materials • The Scientific Method	3.00

2. Structure of Matter 11.00
   • Atomic theory and basic atomic structure including the relationships between sub-atomic particles
   • Periodic Table of Elements and periodic trends to atomic structure
   • Characteristics of the atomic, ionic, and molecular classes of matter
   • Phases of matter (solids, liquids, and gases) and the connections between the properties using a particle model
   • Classification of matter--elements, substances, compounds, mixtures
   • Basic characteristics of solutions, including acids and bases, and their relationship to the pH scale
3. Matter and its Changes 9.00
   • Phases of matter and associated phase changes
   • Chemical and physical changes, and classifying chemical and physical properties of matter
   • Basic principles of chemical bonding and chemical reactivity
   • Energy changes during chemical reactions
4. Motion, Forces and Energy 14.00
   • Motion of objects as related through the concepts of position, displacement, speed, velocity, and acceleration
   • Interpretation of distance vs. time and speed vs. time graphs
   • The relationship between a net force and the motion of an object
   • Explain how action and reaction forces are related to each other
   • Basic forces in the universe including electrostatic, gravitational and magnetic
   • Forms of energy including solar, chemical, magnetic, electric, nuclear, and thermal
   • The relationship between net force, work, and kinetic energy
   • Conservation of energy, and how energy is transformed from one form to another
   • The nature of heat (thermal energy) and heat transfer (conductive, convective, radiant) and their relationship to temperature and temperature measurement
5. Electricity and Magnetism 7.00
   • Electric charge and how charge is transferred from one object to another
   • Models of electric current, voltage, resistance and their interrelationships
   • The construction and operation of simple electrical circuits and the difference between series and parallel combinations of resistors
6. Waves and Light 7.00
   • Longitudinal and transverse waves
   • Properties of sound
   • Doppler effect and Interference
   • Electromagnetic radiation (light), the electromagnetic spectrum and sources of light
   • Relationship between wavelength (or frequency) and color
   • Color perception
   • Reflection and refraction of waves

Total Hours 51.00

Lab

Topics	Hours

1. Measurement and Fundamental Properties 6.00
   • Fundamentals of measuring length, area, volume and mass
   • Density of materials
   • The Scientific Method
2. Structure of Matter 9.00
   • Atomic theory and basic atomic structure including the relationships between sub-atomic particles
   • Periodic Table of Elements and periodic trends to atomic structure
   • Characteristics of the atomic, ionic, and molecular classes of matter
   • Phases of matter (solids, liquids, and gases) and the connections between the properties using a particle model
   • Classification of matter--elements, substances, compounds, mixtures
   • Basic characteristics of solutions, including acids and bases, and their relationship to the pH scale
3. Matter and its Changes 9.00
   • Phases of matter and associated phase changes
   • Chemical and physical changes, and classifying chemical and physical properties of matter
   • Basic principles of chemical bonding and chemical reactivity
   • Energy changes during chemical reactions
4. Motion, Forces and Energy 15.00
   • Motion of objects as related through the concepts of position, displacement, speed, velocity, and acceleration
   • Interpretation of distance vs. time and speed vs. time graphs
   • The relationship between a net force and the motion of an object
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IV. METHODS OF INSTRUCTION

A. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
B. Lecture and Discussion
C. Demonstrations and Visual Aids
D. Internet Explorations
E. Laboratory Exercises

V. METHODS OF EVALUATION

A. Exams/Tests
B. Quizzes
C. Research Projects
D. Papers
E. Oral Presentation
F. Written Examinations
G. Laboratory Activities and Reports
H. Group Projects

VI. EXAMPLES OF ASSIGNMENTS

A. Reading Assignments
    1. Read the chapter on thermal energy. Be prepared to explain the three types of heat transfer and give two examples of each on a quiz.
    2. Read the chapter on speed, velocity and acceleration and be prepared to discuss how they relate to one another and interpret graphs of distance vs. time and velocity vs. time on an exam.

B. Writing Assignments
    1. Write a 200 word paragraph describing the differences between ionic, metallic and covalent bonding. Include two examples of each.
    2. Write a complete paragraph to explain the concept of conservation of energy using specific examples to show energy being conserved.

C. Out-of-Class Assignments
    1. Find an article on a chemical reaction in the real world. This could be anything from a new industrial process, to an explosion, to acid rain. Provide a justification for the validity of the source and present a 5 minute overview to the class.
    2. Take a photo of one of the physics phenomena we have discussed in class, attach a 250 word explanation of the behavior to be turned in during class time.

VII. RECOMMENDED MATERIALS OF INSTRUCTION

Textbooks:

A. Hewitt, Suchocki and Hewitt. Conceptual Physical Science. 5th Edition. Pearson Addison Wesley Publishing, 2012.

Materials Other Than Textbooks:

A. Lab Handouts provided in class
B. Simple scientific calculator

Created/Revised by: Penny Lillie
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