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Physical Science (PSCI) 1520 Introduction to Physical Science Lecture and Laboratory (4) CSU: UC
[Formerly Physical Science 1]

Prerequisite: Successful completion of Mathematics 1050 with a grade of “C” or better.

Advisory: Mathematics 1060 with a grade of “C” or better. Eligibility for English 1500 strongly recommended.

Hours and Units Calculations:

48 hours lecture. (96 Outside of class hours); 48 hours lab (192 Total Student Learning hours) 4 Units

Catalog Description: This course introduces the fundamental concepts of physics and chemistry. Physics topics include motion, force, simple machines, work, energy, conservation of energy, electricity, magnetism, thermodynamics, and electromagnetic radiation. Chemistry topics include atomic theory and structure, the periodic table, chemical and physical properties of elements and compounds, chemical reactions, chemical bonding, solutions, and organic chemistry. The course is designed for liberal arts and education majors.

Type of Class/Course: Degree Credit

Texts: Hewitt, Paul G., John Suchocki, and Leslie A. Hewitt. *Conceptual Physical Science*. 6th ed. Pearson, 2017. Classic Text.

Lab Manual: May, James. *Physical Science 1520 Resource Manual*. 1st ed. GeoJim Publications. 2024.

Additional Instructional Materials: Calculator

Course Objectives:

By the end of the course, a successful student will be able to:

1. apply scientific facts and activities to interpret, evaluate, and make decisions based on scientific knowledge,
2. describe the universe and state the basic physical and chemical laws governing its behavior,
3. demonstrate the relationships between the fields of physics, chemistry, earth science, and astronomy,
4. develop and improve problem solving skills using data and measurements and using conversion of measurements from one system to another as needed, and
5. make the connections between theories and applications by performing experiments, making observations, and collecting data.

Course Level Student Learning Outcomes

1. Students will learn to properly collect data, summarize their results using graphs, compare qualitative and quantitative data, and draw conclusions about the data they obtained.

Local General Education Learning Outcomes

1. Develop an understanding of the relationship between science and other human behaviors.
2. Demonstrate the scientific method.

Course Scope and Content: (Lecture):

Unit I Patterns of Motion and Equilibrium

- A. Physical Science
- B. Scientific Method
- C. Mass
- D. Net Force
- E. The Equilibrium Rule
- F. Speed and Velocity
- G. Acceleration

Unit II Newton's Laws of Motion

- A. Newton's First Law of Motion
- B. Newton's Second Law of Motion
- C. Forces and Interactions
- D. Newton's Third Law of Motion

Unit III Momentum and Energy

- A. Momentum and Impulse
- B. Conservation of Momentum
- C. Energy and Work
- D. Work-Energy Theorem
- E. Conservation of Energy

Unit IV Gravity, Projectiles, and Satellites

- A. The Universal Law of Gravity
- B. Gravity and Distance
- C. Projectile Motion
- D. Circular Satellite Orbits
- E. Escape Speed

Unit V Heat Transfer and Change of Phase

- A. Conduction
- B. Convection
- C. Radiation
- D. Newton's Law of Cooling

- E. Climate Change and the Greenhouse Effect
- F. Heat Transfer and Change of Phase
- G. Melting and Freezing
- H. Boiling

Unit VI Static and Current Electricity

- A. Electric Charge
- B. Coulomb's Law
- C. Electric Field
- D. Electric Potential
- E. Voltage Sources
- F. Electric Current
- G. Electrical Resistance

Unit VII Light

- A. Electromagnetic Spectrum
- B. Transparent and Opaque Materials
- C. Reflection
- D. Refraction
- E. Color
- F. Polarization

Unit VIII Atoms and the Periodic Table

- A. The Elements
- B. Protons and Neutrons
- C. The Periodic Table
- D. Physical and Conceptual Models
- E. The Shell Model

Unit IX Elements of Chemistry

- A. Physical and Chemical Properties
- B. Physical and Chemical Changes
- C. Elements to Compounds
- D. Naming Compounds

Unit X Mixtures

- A. Classification of Matter
- B. Solutions
- C. Solubility

Unit XI Rocks and Minerals

- A. Minerals
- B. Mineral Properties
- C. Classification of Minerals

Unit XII Plate Tectonics and Earth's Interior

- A. Seismic Waves
- B. Earth's Internal Layers
- C. Continental Drift
- D. Theory of Plate Tectonics

Unit XIII The Oceans, Atmosphere, and Climatic Effects

- A. Earth's Atmosphere and Oceans
- B. Components of Earth's Oceans
- C. Components of Earth's Atmosphere
- D. Solar Energy

Unit XIV The Solar System

- A. The Solar System and its Formation
- B. The Sun
- C. The Inner Planets
- D. The Outer Planets
- E. The Earth's Moon

Unit XV Stars and Galaxies

- A. Observing the Night Sky
- B. The Brightness and Color of Stars
- C. The Hertzsprung-Russell Diagram
- D. The Life Cycles of Stars
- E. Blackholes
- F. Galaxies

Unit XVI The Structure of Space and Time

- A. Cosmic Inflation
- B. Dark Matter
- C. Dark Energy
- D. General Relativity
- E. The Fate of the Universe

Course Scope and Content: (Laboratory)

Unit I International System of Units (SI) and Metric System

- A. SI Units
- B. Unit Conversions

Unit II Motion

- A. Velocity
- B. Acceleration

Unit III Force

- A. Newton's Second Law

- B. Action-Reaction Pairs

Unit IV Work, Energy, and Momentum

- A. Work and Force
- B. Conservation of Energy and Momentum

Unit V Gravity

- A. Newton's Universal Law of Gravitation
- B. Free Fall

Unit VI Temperature, Heat, and Radiation

- A. Thermal Emission
- B. Crookes Radiometer

Unit VII Electricity

- A. Current and Voltage
- B. DC Circuits

Unit VIII Light

- A. Particles and Waves
- B. Electromagnetic Spectrum

Unit IX Size of the Atom

- A. Atomic Composition
- B. The Nucleus

Unit X Physical and Chemical Properties

- A. Separation of Mixtures
- B. pH Measurements

Unit XI Nomenclature

- A. Types of Compounds
- B. Naming Compounds

Unit XII Classifying Minerals

- A. Mineral Types
- B. Mineral Tests

Unit XIII Solar Energy

- A. Energy from the Sun
- B. Solar Panels

Unit XIV Size and Scale of the Solar System

- A. Scale Proportions
- B. Distances in the Solar System

Unit XV Classifying Stars

- A. Types of Stars
- B. Hertzsprung-Russell Diagram

Unit XVI Dark Matter and Dark Energy

- A. Cosmological Origins
- B. Current Theory

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying text, chapter handouts, and learning objectives
2. Answering questions
3. Skill practice
4. Completing required reading
5. Problem solving activity or exercise.
6. Written work

Methods of Instruction:

1. Assign reading topics in the textbook and selected references
2. Class lectures will be used to clarify and extend the theoretical and factual concepts present in the text
3. Class discussions and problem-solving sessions
4. Audiovisual materials, relative to some unit of study will be shown to supplement lecture materials
5. Problem sets and questions from the text will be assigned
5. Selected experiments will be assigned in the laboratory for individual student learning
6. Demonstration experiments and lecture demonstrations will be used in the classroom and laboratory

Methods of Evaluation:

1. Substantial writing assignments including:
 - a. essay exams
 - b. laboratory reports
 - c. research reports
2. Computational or non-computational problem-solving demonstrations including:
 - a. exams
 - b. homework problems
 - c. quizzes
 - d. laboratory reports

Laboratory Category: Extensive Laboratory

Pre delivery criteria: All the following criteria are met by this lab:

1. curriculum development for each lab,
2. published schedule of individual laboratory activities,
3. published laboratory activity objectives,
4. published methods of evaluation, and
5. supervision of equipment maintenance, laboratory setup, and acquisition of lab materials and supplies.

During laboratory activity of the laboratory: All of the following criteria are met by this lab:

1. Instructor is physically present in lab when students are performing lab activities.
2. Instructor is responsible for active facilitation of laboratory learning.
3. Instructor is responsible for active delivery of curriculum.
4. Instructor is required for safety and mentoring of lab activities.
5. Instructor is responsible for presentation of significant evaluation.

Post laboratory activity of the laboratory: All of the following criteria are met by this lab:

1. Instructor is responsible for personal evaluation of significant student outcomes (lab exercises, exams, practicals, notebooks, portfolios, etc.) that become a component of the student grade that cover the majority of lab exercises performed during the course.
2. Instructor is responsible for supervision of laboratory clean up of equipment and materials.

Supplemental Data:

TOP Code:	190100 Physical Sciences, General
SAM Priority Code:	E: Non-Occupational
Funding Agency:	Not Applicable
Program Status:	1: Program Applicable
Noncredit Category:	Not Applicable
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Not Applicable
Prior to College Level:	Not Applicable
Cooperative Work Experience:	No

Eligible for Credit by Exam:	No
Eligible for Pass/No Pass:	Yes
Discipline:	Physical Science