



El Camino College  
COURSE OUTLINE OF RECORD – Official

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| <b>Course Acronym:</b>              | PSCI  |
| <b>Course Number:</b>               | 25  |
| <b>Descriptive Title:</b>           | Exploring Physical Sciences   |
| <b>Division:</b>                    | Natural Sciences  |
| <b>Department:</b>                  | Physics   |
| <b>Course Disciplines:</b>          | Astronomy, Chemistry, Physical Science, Physics   |
| <b>Catalog Description:</b>         | <p>This course is a broad based introductory study of the physical sciences for future elementary and middle school educators. The topics covered are part of the California science standards and are designed to introduce physics and chemistry. Topics include: energy, forces, motion, magnetism, electricity, gravitational interactions, properties of light and sound, changes of state, physical properties, atomic structure, and chemical changes. Drawing from their own observations and laboratory experiments, students will develop concepts and construct models that can predict outcomes of experiments.</p> <p>Note: Physical Sciences 25 is not designed for majors in physics, astronomy, or chemistry.</p> |
| <b>Prerequisite:</b>                |   |
| <b>Co-requisite:</b>                |   |
| <b>Recommended Preparation:</b>     | Eligibility for English 1A  |
| <b>Enrollment Limitation:</b>       |   |
| <b>Hours Lecture (per week):</b>    | 2   |
| <b>Hours Laboratory (per week):</b> | 4   |
| <b>Outside Study Hours:</b>         | 4   |
| <b>Total Course Hours:</b>          | 108   |
| <b>Course Units:</b>                | 3   |
| <b>Grading Method:</b>              | Letter Grade only   |
| <b>Credit Status:</b>               | Credit, degree applicable   |
| <b>Transfer CSU:</b>                | Yes   |
| <b>Effective Date:</b>              | 12/09/2002  |
| <b>Transfer UC:</b>                 | Yes   |
| <b>Effective Date:</b>              | Fall 2006   |
| <b>General Education: ECC</b>       | Area 1 - Natural Sciences   |
| <b>Term:</b>                        |   |

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| <b>Other:</b>                     |   |
| <b>CSU GE:</b>                    | Area B1 - Physical Universe and its Life Forms: Physical Science  |
| <b>Term:</b>                      | Fall 2007   |
| <b>Other:</b>                     |   |
| <b>IGETC:</b>                     | Area 5A - Physical Science  |
| <b>Term:</b>                      | Fall 2007   |
| <b>Other:</b>                     |   |
| <b>Student Learning Outcomes:</b> | <p><b>SLO#1 Applying Relevant Principles</b></p> <p>Students can identify the physical principles which are relevant in a given physical situation (floating object, falling object...) and explain how these principles are manifested in, and influence the behavior of a described physical situation.</p>   |
| <b>Course Objectives:</b>         | <ol style="list-style-type: none"> <li>1. Learn proper measurement techniques for laboratory experiments.</li> <li>2. Use Newton's First and Second Laws to predict and interpret outcomes of experiments.</li> <li>3. Understand the steps of the scientific method.</li> <li>4. Understand concepts of motion, including position, displacement, speed, velocity, and acceleration.</li> <li>5. Describe different forms of energy, how energy is transformed from one form to another, and the Law of Conservation of Energy.</li> <li>6. Understand Newton's Third Law (action and reaction forces)</li> <li>7. Compare and contrast magnetic, electrostatic, and gravitational interactions.</li> <li>8. Describe properties of waves and light.</li> <li>9. Use the Periodic Table to analyze basic properties of elements.</li> <li>10. Classify substances as elements or compounds.</li> <li>11. Understand matter and its phase changes.</li> <li>12. Distinguish between types of chemical bonds.</li> <li>13. Perform and describe simple chemical reactions.</li> </ol>  |
| <b>Major Topics:</b>              | <p><b>I. Measurement and Fundamental Properties (4 hours, lecture)</b></p> <ol style="list-style-type: none"> <li>A. Fundamentals of measuring length, area, volume and mass</li> <li>B. Density of materials</li> <li>C. The Scientific Method</li> </ol> <p><b>II. Motion, Forces and Energy (8 hours, lecture)</b></p> <ol style="list-style-type: none"> <li>A. Motion of objects as related through the concepts of position, displacement, speed, velocity, and acceleration</li> <li>B. The relationship between a net force and the motion of an object</li> <li>C. The relationship between net force, work, and kinetic energy</li> <li>D. Action and reaction forces</li> <li>E. Basic forces in the universe including electrostatic, gravitational, and magnetic</li> <li>F. Forms of energy including solar, chemical, magnetic, electric, nuclear, and thermal</li> <li>G. The conservation of energy, and how energy is transformed from one form to another</li> <li>H. The nature of heat (thermal energy) and heat transfer (conductive, convective, radiant) and their relationship to temperature and temperature measurement</li> </ol> |

### **III. Electricity and Magnetism (6 hours, lecture)**

- A. Electric charge and how charge is transferred from one object to another
- B. Models of electric current, voltage, resistance and their interrelationships
- C. Series and parallel circuits
- D. Magnetism

### **IV. Waves and Light (6 hours, lecture)**

- A. Longitudinal and transverse waves
- B. Properties of sound
- C. Doppler effect and interference
- D. Electromagnetic radiation, the electromagnetic spectrum and sources of light
- E. Relationship between wavelength and color
- F. Color perception
- G. Reflection and refraction of waves

### **V. Structure of Matter (8 hours, lecture)**

- A. Atomic theory and basic atomic structure including the relationships between sub-atomic particles
- B. Periodic Table of Elements and periodic trends
- C. Atoms and bonding
- D. Classification of matter-elements, compounds, mixtures
- E. Basic characteristics of solutions
- F. Acids, bases, and pH

### **VI. Matter and its changes (4 hours, lecture)**

- A. Phases of matter and phase changes
- B. Chemical and physical properties and changes
- C. Basic principles of bonding and chemical reactivity
- D. Energy changes during chemical reactions

### **VII. Laboratory Experiments and Exercises to be chosen from the following: (72 hours, lab)**

- A. Units and Calculations
- B. Graphing Mass vs Time for a Candle
- C. Density
- D. Graphing Motion in Real Time
- E. Force, Mass, and Acceleration
- F. Work on an Inclined Plane
- G. Newton's Laws of Motion
- H. Simple Battery
  
- A. Simple Electric Circuits
  
- J. Current and Magnetic Fields
- K. Waves
- L. Solar Energy with Toys

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|   | <p>M. Electron Dot Diagrams</p> <p>N. Molecular Models</p> <p>O. pH Indicators</p> <p>P. Separation of a Mixture</p> <p>Q. Chemical Reactions</p> <p>R. Simple Reactivity Series</p> <p>S. Exothermic and Endothermic Processes</p>   |
| <b>Total Lecture Hours:</b>                                   | 36  |
| <b>Total Laboratory Hours:</b>                                | 72  |
| <b>Total Hours:</b>   | 108   |
| <b>Primary Method of Evaluation:</b>                          | 2) Problem solving demonstrations (computational or non-computational)  |
| <b>Typical Assignment Using Primary Method of Evaluation:</b> | Consider the following pure substances: NaCl and H <sub>2</sub> O. Identify the bonds present between atoms and the type of bond (ionic, covalent or metallic) exhibited in each compound. In a separate paragraph, describe the differences in the bonding present in NaCl compared to H <sub>2</sub> O. Describe how these differences affect the physical state, melting and boiling points of the compounds.  |
| <b>Critical Thinking Assignment 1:</b>                        | In a short paragraph, explain how you would magnetize a nail such that the head of the nail becomes a north pole and the pointed end of the nail becomes a south pole. In your explanation, include a microscopic model sketch of what might be different between the unmagnetized and the magnetized nail.   |
| <b>Critical Thinking Assignment 2:</b>                        | Examine the diagram below. Rank the four identical bulbs in the circuit according to brightness using the space provided, using 1 as lowest brightness and 4 as highest brightness. In a short paragraph, explain your reasons for the ranking.   |
| <b>Other Evaluation Methods:</b>                              | Completion, Essay Exams, Homework Problems, Laboratory Reports, Matching Items, Multiple Choice, Other Exams, Presentation, Quizzes, True/False, Written Homework   |
| <b>Instructional Methods:</b>                                 | Demonstration, Discussion, Group Activities, Lab, Lecture   |
| <b>If other:</b>  |   |
| <b>Work Outside of Class:</b>                                 | Answer questions, Observation of or participation in an activity related to course content (such as theatre event, museum, concert, debate, meeting), Problem solving activity, Required reading, Study, Written work (such as essay/composition/report/analysis/research)  |
| <b>If Other:</b>  | Students develop and present teaching activities.   |
| <b>Up-To-Date Representative Texts:</b>                       | <p>Flowers, Paul et al. Chemistry: Atoms First 2e. OpenStax, 2023. <a href="https://openstax.org/details/books/chemistry-atoms-first-2e">https://openstax.org/details/books/chemistry-atoms-first-2e</a>. <i>Licensed under CC BY 4.0.</i></p> <p>and</p> <p>Urone, Paul and Hinrichs, Roger. College Physics 2e. OpenStax, 2023. <a href="https://openstax.org/details/books/college-physics-2e">https://openstax.org/details/books/college-physics-2e</a>. <i>Licensed under CC BY 4.0.</i></p> |
| <b>Alternative Texts:</b>                                     | Gergel-Hackett, N. Exploring the Physical World: Introductory Chemistry and Physics, VIVA Open Publishing, 2021.  |

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|  | <p><a href="https://oercommons.org/courses/exploring-the-physical-world-introductory-chemistry-and-physics/view">https://oercommons.org/courses/exploring-the-physical-world-introductory-chemistry-and-physics/view</a></p> <p>Hewitt, P., Suchoki, J. and Hewitt, L. Conceptual Physical Science, Pearson, 6th edition, 2016. (Discipline Standard)</p>  |
| <b>Required Supplementary Readings:</b>  |  |
| <b>Other Required Materials:</b>   | Laboratory Manual for Conceptual Physical Science, 6th edition, Hewitt and Baird, 2017. (Discipline Standard)  |
| <b>Requisite:</b>  |  |
| <b>Category:</b>   |  |
| <b>Requisite course(s): List both prerequisites and corequisites in this box.</b>  |  |
| <b>Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).</b>                     |  |
| <b>Requisite Skill:</b>  |  |
| <b>Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable</b>   |  |
| <b>Requisite course:</b>   |  |
| <b>Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).</b>                     |  |
| <b>Requisite Skill:</b>  | Eligibility for English 1A   |
| <b>Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable</b> | <p><b>Students in this course need to have good reading skills to understand and interpret information in their textbooks. The reading skills developed will greatly enhance their chance for successfully completing this course.</b></p> <p>Summarize, analyze, evaluate, and synthesize college-level texts.</p> <p>Write a well-reasoned, well-supported expository essay that demonstrates application of the academic writing process.</p> |
| <b>Enrollment Limitations and Category:</b>  |  |
| <b>Enrollment Limitations Impact:</b>  |  |

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| <b>Course Created by:</b>               | Susana Prieto |
| <b>Date:</b>                            | 05/10/2018    |
| <b>Original Board Approval Date:</b>    | 12/09/2002    |
| <b>Last Reviewed and/or Revised by:</b> | Susan Stolovy |
| <b>Date:</b>                            | 09/18/2023    |
| <b>Last Board Approval Date:</b>        | 12/18/2023    |
| <b>Effective Term:</b>                  | FALL 2024     |