

# Lassen Community College Course Outline

## CHEM 40 – Survey of Chemistry and Physics

3.0 Units

### I. Catalog Description

This is an investigation of the basic principles of physics and chemistry including matter, physical and chemical properties, energy, motion, light, atomic structure, bonding, solutions and chemical reactions. The interdependence of chemistry and physics will be emphasized. This course is intended for non-science majors and recommended for students in the California State Teacher Preparation Program. This course is web-enhanced and has been approved for online and hybrid delivery.

#### Prerequisites:

Prerequisite(s): Elementary Algebra

#### Co-requisites: None

Transferable to CSU/UC

*C-ID CHEM 140*

51 hours lecture, 102 Expected Outside Class Hours, 153 Total Student Learning Hours  
Scheduled: Fall, Spring

### II. Coding Information

Repeatability: Not Repeatable, Take 1 Time

Grading Option: Graded or Pass/No Pass

Credit Type: Credit – Not Degree Applicable

TOP Code: 190100 Physical Sciences, General

### III. Course Objectives

#### A. Course Student Learning Outcomes

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

1. Correctly analyze natural phenomena using the concepts of physics and chemistry

#### B. Course Objectives

Upon completion of this course the student will be able to solve problems related to:

1. Describe the states of matter and associate phase changes.
2. Classify matter as elements, compounds, mixtures and describe properties of each.
3. Describe basic atomic structure including the fundamental particles and electron energy levels
4. Explain the history and structure of the periodic table.
5. Explain and describe different ways atoms combine to form compounds.
6. Describe the motion of objects as related through the concepts of position, displacement, speed, velocity and acceleration.
7. Use Newton's Laws to predict and explain the motion of an object.
8. Discuss the type of energy present in a system and use conservation of energy to solve problems.
9. Explain the requirements for a complete circuit in terms of a model of electric charge.
10. Describe color perception based on the wave nature of light and its interactions.

11. Understand fundamentals of taking and recording measurements including measuring length, area, volume, mass, density, significant figures, converting between units and scientific notation.
12. Practical applications to both the chemistry and physics lecture objectives.
13. Drawing conclusions between data and results including constructing graphs and identifying relationships between variables.

#### **IV. Course Content**

The following topics may be included; however, the order of presentation, relative emphasis, and the depth of treatment will depend on the instructor

##### **A. Measurement & Fundamental Properties**

1. Fundamentals of measuring length, area, volume and mass
2. Density of materials
3. The Scientific Method

##### **B. Structure of Matter**

1. Atomic theory and basic atomic structure including the relationships between sub-atomic particles
2. Periodic Table of Elements and periodic trends to atomic structure
3. Characteristics of the atomic, ionic, and molecular classes of matter
4. Phases of matter (solids, liquids, and gases) and the connections between the properties using a particle model
5. Classification of matter--elements, substances, compounds, mixtures
6. Basic characteristics of solutions, including acids and bases, and their relationship to the pH scale

##### **C. Matter and its Changes**

1. Phases of matter and associated phase changes
2. Chemical and physical changes, and classifying chemical and physical properties of matter
3. Basic principles of chemical bonding and chemical reactivity
4. Energy changes during chemical reactions

##### **D. Motion, Forces and Energy**

1. Motion of objects as related through the concepts of position, displacement, speed, velocity, and acceleration
2. Interpretation of distance vs. time and speed vs. time graphs
3. The relationship between a net force and the motion of an object
4. Explain how action and reaction forces are related to each other
5. Basic forces in the universe including electrostatic, gravitational and magnetic
6. Forms of energy including solar, chemical, magnetic, electric, nuclear, and thermal
7. The relationship between net force, work, and kinetic energy
8. Conservation of energy, and how energy is transformed from one form to another
9. The nature of heat (thermal energy) and heat transfer (conductive, convective, radiant) and their relationship to temperature and temperature measurement

##### **E. Electricity and Magnetism**

1. Electric charge and how charge is transferred from one object to another
2. Models of electric current, voltage, resistance and their interrelationships
3. The construction and operation of simple electrical circuits and the difference between series and parallel combinations of resistors

- F. Waves and Light
1. Longitudinal and transverse waves
  2. Properties of sound
  3. Doppler effect and Interference
  4. Electromagnetic radiation (light), the electromagnetic spectrum and sources of light
  5. Relationship between wavelength (or frequency) and color
  6. Color perception
  7. Reflection and refraction of waves

## V. Assignments

### A. Appropriate Readings

Standard college level texts and articles from the media.

### B. Writing Assignments

Short answer response, essay examinations

### C. Expected Outside Assignments

Problem solving by application of chemical and physical principles. Reading assigned materials.

### D. Specific Assignments that Demonstrate Critical Thinking

This course emphasizes observation, synthesis of information to arrive at generalizations, and use of these generalizations as a basis for prediction. Class discussion of example problems, homework, and problem solving sessions.

## VI. Methods of Evaluation

### Traditional Classroom Instruction

Each student will be given a syllabus at the start of the class that indicates the evaluation tools to be used in the course. The course may include but not constrained to evaluation tools such as homework, quizzes, examinations, essays, and presentations.

### Online Delivery

Students will be evaluated using online methods. Online students will complete assignments as described in the course outline using a variety of online methods such as online submission of assignments, online quizzes, and exams.

### Hybrid Evaluation

All quizzes and exams will be administered during the in person class time. Students will be expected to complete online assignments and activities equivalent to in class assignments and activities for the online portion of the course.

### Web-enhanced course

Additional information and resources may be made available to students online. , and students may be required to do research and complete and/or submit assignments online. Quizzes may be administered online, but exams and summative assessments must be administered face-to-face.

## VII. Methods of Delivery

Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

Traditional Classroom Delivery     Correspondence Delivery

Hybrid Delivery

Online Delivery

Web-enhance course

### **Traditional Classroom Instruction**

Lecture, demonstration, multi-media presentation, and discussion

### **Online Delivery**

Online written lectures and/or video lectures will be made available to students online. Students will be expected to complete online exercises/assignments contained on website. Additionally, email/canvas communications and web-links will comprise the method of instruction.

### **Hybrid Delivery**

A combination of traditional classroom and online instruction will be utilized. Each semester a minimum of 17 hours, or 1/3 of the lecture hours, will be taught face-to face by the instructor and the remaining hours will be instructed online through the technology platform adopted by the District. Traditional class instruction will consist of exercises/assignments, lectures, visual aids, and practice exercises. Online delivery will consist of exercises/assignments, lecture posts, discussions, adding extra resources and other media sources as appropriate.

### **Web-Enhanced Course Delivery**

Same as face to face with additional information and resources made available to students online, and students may be required to do research and complete and/or submit assignments online. Quizzes may be administered online, but exams and summative assessments must be administered face-to-face.

## **VIII. Representative Texts and Supplies**

### **Traditional Classroom Instruction**

Tillery, B, *Physical Science*, 12<sup>th</sup> edition, 2020, McGraw Hill ISBN10: 1260150542 | ISBN13: 9781260150544

### **Online and Hybrid Delivery**

Modified *Physical Science* McGraw Hill Connect (with eText) - access code ISBN10: 126041129X | ISBN13: 9781260411294. Specific Course ID will be provided by the instructor.

## **IX. Discipline/s Assignment**

Chemistry/Physics

## **X. Course Status**

Current Status: Active

Original Approval Date: 12/03/2019

Board Approval Date: 12/17/2019

Chancellor's Office Approval Date: 01/05/2020

Revised By: Yuting Lin

Curriculum/Academic Standards Committee Revision Date: 11/16/2021