COMMON COURSE OUTLINE: Course discipline/number/title: CHEM 1127: Chemical Principles I

A. CATALOG DESCRIPTION
   1. Credits: 4
   2. Hours/Week: 3 hours lecture and one 3-hour lab per week
   3. Prerequisites (Course discipline/number): CHEM 1101 or equivalent, or high school chemistry with at least a grade of C. MATH 0099 or equivalent.
   4. Co-requisites (Course discipline/number): None
   5. MnTC Goals (if any): Goal 2/Critical Thinking and Goal 3/Natural Science

This is the first semester of an in-depth study of general chemistry. Topics cover basic terminology and chemical principles pertaining to the areas of measurements, atomic theory, nomenclature, reactions, chemical calculations, solids/liquids/gases, thermochemistry, quantum theory, periodicity, bonding, and molecular geometry.

B. DATE LAST REVISED (Month, year): March, 2011

C. OUTLINE OF MAJOR CONTENT AREAS:
   1. Measurements
      a) Significant figures
      b) Scientific notation
      c) Measurement systems
      d) Dimensional analysis
   2. Basic Atomic Structure of Matter
      a) Classification of matter
      b) Subatomic particles
      c) Chemical formulas and nomenclature
   3. Chemical Calculations
      a) % composition
      b) Stoichiometry
      c) Molarity
   4. Chemical Reactions
      a) Balancing equations
      b) Net ionic equations
      c) Basic redox reactions
   5. Thermochemistry
      a) Calorimetry
      b) Hess's Law
      c) Standard heats of reaction
   6. Quantum Theory
      a) Electron configurations
      b) Orbital diagrams
      c) Periodic trends
   7. Bonding
      a) Ionic bonding
      b) Covalent bonding
      c) Metallic bonding
      d) Valence bond theory
      e) MO theory
C. OUTLINE OF MAJOR CONTENT AREAS: Continued . . .

8. Molecular Shape and Structure
   a) Lewis Structures
   b) VSEPR theory
   c) Molecular Polarity

9. Solids, Liquids, Gases
   a) Kinetic molecular theory
   b) Gas laws
   c) Intermolecular forces

The laboratory activities are used to enhance, correlate and demonstrate a variety of methods and equipment used in scientific inquiry and as verification of various scientific laws and theories. Laboratory measurement are obtained and recorded by students during the lab period. The results are analyzed and certain specified calculations are required to demonstrate and verify related laws and relationships. Reports and/or quizzes are handed in for evaluation.

D. LEARNING OUTCOMES (GENERAL): The student will be able to:

1. Use basic chemical vocabulary.
2. Solve problems using experimental and/or simulated data and relate them to the chemical principles and laws involved.
3. Describe chemical interactions on the molecular scale.
4. Evaluate the uncertainty of laboratory and/or simulated data and values calculated from the data.
5. Perceive how chemistry relates to one’s everyday activities.

E. LEARNING OUTCOMES (MNTE):

Goal 2/Critical Thinking: Students will be able to:

1. Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.
2. Imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives, which can give alternative meanings or solutions to given situations or problems.
3. Analyze the logical connections among the facts, goals, and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.
4. Recognize and articulate the value assumptions, which underlie and affect decisions, interpretations, analyses, and evaluations made by ourselves and others.

Goal 3/Natural Sciences: Students will be able to:

1. Demonstrate understanding of scientific theories.
2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, student’s laboratory experience in the collection of data, it’s statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
4. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

F. METHODS FOR EVALUATION OF STUDENT LEARNING:

1. Laboratory reports and/or quizzes
2. Problem solving tests
3. Quizzes
4. Group project or report

G. RCTC CORE OUTCOME(S) ADDRESSED:

☒ Communication ☑ Critical Thinking ☐Personal/Professional Accountability
☐ Global Awareness/Diversity ☐ Aesthetic Response
H. SPECIAL INFORMATION (if any):
The initial lab session explains and familiarizes the student with general safety hazards and safety equipment in the lab. During the pre-lab discussion, the hazardous characteristics of the chemicals used during the lab are discussed. The students will be instructed on the proper disposal of any hazardous products. The instructor will direct all students to wear necessary protective equipment while working with the chemicals. A copy of Material Safety Data Sheets for chemicals used is available in the lab.