

Course discipline/number/title: CHEM 1128: Chemical Principles II**A. CATALOG DESCRIPTION**

1. **Credits:** 4
2. **Hours/Week:** 3 lecture, 3 lab
3. **Prerequisites (Course discipline/number):** CHEM 1127
4. **Other requirements:** None
5. **MnTC Goals (if any):** NA

B. COURSE DESCRIPTION: This second semester General Chemistry course is an in-depth study of terminology and chemical principles pertaining to the areas of basic organic chemistry, solutions, reaction kinetics, equilibria, acid-base chemistry, solubility products, thermodynamics, electrochemistry, and nuclear chemistry.

C. DATE LAST REVISED (Month, year): May, 2023

D. OUTLINE OF MAJOR CONTENT AREAS:

1. Basic Organic Chemistry
 - a) Hydrocarbons
 - b) Isomers
 - c) Functional groups
 - d) Reactions
2. Solutions
 - a) Solubility
 - b) Heat of solution
 - c) Concentration units
 - d) Colligative properties
 - e) Colloids
3. Kinetics
 - a) Rate laws
 - b) Reaction order
 - c) Zero, first, second order integrated rate laws
 - d) Half-life
 - e) Collision theory
 - f) Reaction energy diagrams
 - g) Catalysis
 - h) Mechanisms
4. Equilibria
 - a) Equilibrium expression
 - b) Reaction quotient
 - c) Le Châtelier's principle
5. Acids and Bases
 - a) Arrhenius, Brønsted-Lowry, and Lewis concepts
 - b) Autoionization of water
 - c) pH
 - d) K_a and K_b
 - e) Acid-base titrations
6. Other Aspects of Aqueous Equilibria
 - a) Common ion effect
 - b) Buffers
 - c) K_{sp} and K_f

C. OUTLINE OF MAJOR CONTENT AREAS: Continued. . .

7. Thermodynamics
 - a) Entropy
 - b) Free energy
8. Electrochemistry
 - a) Electron transfer
 - b) Half reactions
 - c) Voltaic cells
 - d) Half-cell potentials
 - e) Nernst equation
9. Nuclear Chemistry
 - a) Radioactive decay
 - b) Carbon dating
 - c) Nuclear fission and fusion

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

1. Use proper chemical vocabulary in written laboratory reports.
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. Acquire basic skills in laboratory operations including making measurements, preparing solutions, operating instrumentation, designing experiments, and reporting and interpreting both quantitative and qualitative data.
5. Recognize chemical applications in everyday life.

F. LEARNING OUTCOMES (MNTC): NA

G. METHODS FOR EVALUATION OF STUDENT LEARNING: Methods may include but are not limited to:

1. Laboratory reports
2. Quizzes
3. Problem solving exams
4. Oral presentation of project
5. American Chemical Society standardized exam

G. RCTC CORE OUTCOME(S). This course contributes to meeting the following RCTC Core Outcome(s):
Communication. Students will communicate appropriately for their respective audiences.

Critical Thinking. Students will think systematically and explore information thoroughly before accepting or formulating a position or conclusion.

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.