CHM 152 GENERAL CHEMISTRY II

COURSE DESCRIPTION:

Prerequisites: CHM 151 with a C or better
Corequisites: None

This course continues the study of the fundamental principles and laws of chemistry. Topics include kinetics, equilibrium, ionic and redox equations, acid-base theory, electrochemistry, thermodynamics, introduction to nuclear and organic chemistry, and complex ions. Upon completion, students should be able to demonstrate an understanding of chemical concepts as needed to pursue further study in chemistry and related professional fields. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples. *This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences/mathematics.* Course Hours Per Week: Class, 3. Lab, 3. Semester Hours Credit, 4.

LEARNING OUTCOMES:

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

a. Define chemical kinetics and chemical equilibrium
b. Explain acids, bases, pH and their equilibria
c. Understand Bronsted-Lowry and Lewis acid base theory
d. Explain common ion, buffer solutions, and solubility products
e. Define spontaneity and identify such processes
f. Explain the three laws of thermodynamics
g. Determine potentials and worked performed by galvanic cells
h. Describe electrolysis and corrosion via electrochemical terms
i. Explain radioactive decay and transmutation, and differentiate fission and fusion
j. Explain transition metals, coordination compounds, isomerism, and explain color changes in chemical terms.
k. Differentiate between the various classes of organic compounds
l. Explain amino acids, proteins, fats, carbohydrates, and DNA
m. Perform acid base titrations and explain the data
n. Identify metallic elements qualitatively
o. Improve computer skills learned in CHM 151

OUTLINE OF INSTRUCTION

I. Chemical kinetics
   A. Reaction rates and mechanisms
   B. Catalysis

II. Chemical equilibrium
   A. Homogeneous and heterogeneous equilibria
   B. Le Chatelier's principle

C. Relationship between chemical equilibria and chemical kinetics

III. Acids and bases
- A. Acidic and basic solutions; pH
- B. Bronsted-Lowry and Lewis theory of acids and bases
- C. Strong acids and bases; weak acids and bases
- D. Titrations and quantitative analysis

IV. Aqueous equilibria
- A. Buffer solutions and common-ion effect
- B. Solubility equilibria and the solubility constant
- C. Qualitative analysis for metallic elements

V. Chemical thermodynamics
- A. Spontaneity and thermodynamics; enthalphy
- B. Entropy and the Second Law of thermodynamics
- C. Gibbs free energy
- D. Free energy relationships to equilibrium constant and work

VI. Electrochemistry
- A. Galvanic and voltaic cells
- B. EMF, cell potential, and batteries
- C. The Nernst equation
- D. Electrolysis and corrosion

VII. Nuclear chemistry
- A. Spontaneous radioactivity and transmutation
- B. Fission and fusion
- C. Biological effects

VIII. Transition elements and coordination chemistry
- A. Transition metal oxidation states
- B. Magnetism in transition metals
- C. Electrical/heat conduction in metals
- D. Structure of complexes
- E. Chelates, nomenclature and isomerism
- F. Color

IX. Organic and biochemistry
- A. Hydrocarbons and their various derivatives
- B. Petroleum
- C. Polymers
- D. Proteins, amino acids
- E. Carbohydrates, fats
- F. Nucleic acids and DNA

REQUIRED TEXT AND MATERIALS:

To be selected by Instructor/Discipline Chair.

STUDY MODULES:
Chapter 13: Liquids and Solids

Chapter 14: Solutions – To view this as a slideshow, in the gray navigation bar at the top, choose *View*, then choose *From Beginning*

Chapter 15: Chemical Kinetics

Chapter 16: Chemical Equilibrium

Chapter 17: Acids and Bases (Part 1) – To view this as a slideshow, in the gray navigation bar at the top, choose *View*, then choose *From Beginning*

Chapter 18: Acids and Bases (Part 2)

Chapter 19: Thermochemistry (Part III)