

**NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
CHM 112 - GENERAL CHEMISTRY II (4 CR)**

Course Description

Explores the fundamental laws, theories, and mathematical concepts of chemistry. Designed primarily for science and engineering majors. Requires a strong background in mathematics.

Part II of II. Lecture 3 hours. Laboratory 3 hours. Total 6 hours per week.

General course purpose

This is the second half in the two semester College chemistry series. The goal of this course is to become further aware of the fundamental laws, theories and mathematical concepts of chemistry. The emphasis will also be on problem solving and critical thinking skills. Topics to be covered include Liquids and Solids; Solutions; Kinetics; Chemical Equilibrium; Acids and Bases; Aqueous Equilibria; Thermodynamics; Electrochemistry.

- 1) Develop Skills in problem solving and critical thinking.
- 2) To Interpret and analyze tabulated and graphical data.
- 3) Apply concepts to various chemical systems.

Course Prerequisites/Corequisites

Prerequisite: CHM 111 with a grade of C or higher.

Course Objective

As a result of the learning experiences provided in this course, the student should be able to:

- Describe properties of solids and liquids and types of intermolecular forces in solids and liquids
- Describe and interpret Phase diagrams
- Apply the concepts and perform calculations involving various concentration units, Colligative properties, Equilibrium, Reaction rates, Aqueous equilibria, Free energy, Cell potentials, Nernst equation.
- Predict the effect of various stresses on equilibrium systems.
- Outline the properties of acids, bases, and buffers and perform calculations to measure the pH of such solutions.
- Perform calculations using the solubility product and estimate the solubility of a substance.

Major Topics to be Included:**1. Liquid and solid states**

- a. Properties of liquids:
 - Intermolecular forces
 - vapor pressure
 - boiling point
 - surface tension
 - viscosity
 - capillary action
- b. Properties of solids:
 - molecular substances
 - metals
 - ionic substances
 - network atomic solids
- c. Phase diagrams

2. Solutions

- a. Concentration units
- b. Principles of solubility
- c. Colligative properties of electrolytes and non-electrolytes

3. Kinetics

- a. Rate laws
- b. Reaction mechanisms
- c. Activation energy
- d. Catalysis

4. Chemical Equilibria

- a. Le Chatelier's principle
- b. Gaseous equilibria
- c. Acid-base equilibria
 - pH of acids, bases and salt solutions
 - buffers
 - titration curves
- d. Solubility equilibria

5. Thermodynamics

- a. Entropy
- b. Free energy
- c. Spontaneity

6. Electrochemistry

- a. Balancing redox equations
- b. Standard cell potentials
- c. Voltaic cells
- d. Electrochemical cells
- e. Nernst equation

7. Nuclear Chemistry (optional)

- a. Types of radiation
- b. Nuclear stability
- c. Kinetics of nuclear decay

CHM 112 Lab Objectives

As a result of the learning experience provided in the laboratory component of this series, the student should be able to:

1. Practice safe procedures in the laboratory.
 - a. Transferring and dispensing chemicals in laboratory,
 - b. Disposing of chemicals safely in laboratory
 - c. Safety data sheets (SDS)
2. Use basic techniques of:
 - a. Precise weighing
 - b. pH measurement
 - c. Volume measurement and titration techniques
 - d. Quantitative analysis
 - e. Qualitative analysis
 - f. Graphical analysis
 - g. Spectrophotometric techniques
3. Calculate experimental results to correct number of significant figures, including analysis of error.
4. Use statistics to determine validity of data
5. Analyze and interpret the experimental results and draw appropriate conclusions.
6. Prepare written laboratory report including 3-5 above