NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ENVIRONMENTAL ENGINEERING
SANITARY ENGINEERING PROGRAM

AA223 – CHEMISTRY II

I. GENERAL INFORMATION

CODE	:	AA223 Chemistry II
SEMESTER	:	2
CREDITS	:	3
HOURS PER WEEK	:	5 (Theory – Practice - Laboratory)
PREREQUISTE	:	AA213 Chemistry I
CONDITION	:	Compulsory

II. COURSE DESCRIPTION

The course provides students the knowledge of the fundamental concepts and principles of chemical thermodynamics including the first, second and third law of thermodynamics, chemical equilibrium and chemical kinetics for analyzing the speed of chemical reactions. Students also analyze the ionic equilibrium in ionic solutions, and electrochemistry and corrosion processes.

III. COURSE OUTCOMES

1. Identify the scientific character of Chemistry and appraise the objectivity of the discipline.
2. Work with basic mathematical tools in the study of chemistry.
3. Analyze and interpret chemical transformations.
4. Develop the abilities to model, pose and solve problems related to chemical thermodynamics and chemical kinetics.
5. Analyze, interpret and apply the concept of chemical equilibrium and ionic equilibrium.
6. Understand and analyze electrochemistry and corrosion processes.

IV. COURSE CONTENTS

1. CHEMICAL THERMODYNAMICS

First thermodynamics law. Thermal chemistry. Hess law. Second thermodynamics law. Third thermodynamics law.

2. CHEMICAL KINETICS

Speed of chemical reactions. Gulber and Waage law. Factor affecting speed of reactions. Reaction order. Activation energy and catalyzers.

3. CHEMICAL EQUILIBRIUM

Equilibrium and stability. Physical equilibrium and chemical equilibrium. Determination of equilibrium constant. Influence of temperature. Chemical reactions. Le Chatelier principle.

4. IONIC EQUILIBRIUM IN IONIC SOLUTIONS

Acids and bases. Theories of Arrhenius, Bronsted-Lowry and Lewis. Strong and weak electrolytes. Ionic equilibrium constant. Ionization degree. Water ionic product. Hydrogen potential pH scale. pOH, pKa, pKb, pKw. Common ion. Salt hydrolysis. Buffer solutions. Solubility. Kps. Acid, base indexes. Titration.

5. **ELECTROCHEMISTRY AND CORROSION**
   REDOX normal potentials. REDOX strength. Galvan cells. Potential of Galvan cells. Nernst equation. Concentration cells. Fuel cells. Corrosion. Corrosion speed. Electrolytic cells. Faraday law.

V. LABORATORY AND PRACTICE

Laboratory 1: Speed of chemical reactions
Laboratory 2: Application of LeChatelier principle
Laboratory 3: Ionic equilibrium
Laboratory 4: REDOX potentials
Laboratory 5: Faraday law

VI. METHODOLOGY

The course consists of theory, practice and laboratory sessions. The instructor presents the concepts and chemistry laws and principles using applets and videos. Problems related to engineering are solved with active student participation. Laboratory experiences are carried out using specialized equipment and software simulation. For every experience, students work in group and present a report summarizing main results, analysis and conclusions. Student active participation is promoted.

VII. GRADING SYSTEM

The Final Grade (FG) is calculated with the following formula:

FG = (EP + EF + PP) / 3

EP: Mid-term exam EF: Final exam PP: Average of quizzes and laboratories

VIII. BIBLIOGRAPHY

1. BROWN THEODORE- LEMAY EUGENE.
   Chemistry: The Central Science
   Prentice Hall Editorial, 20102
2. CHANG RAYMOND
   Chemistry
   McGraw-Hill Editorial, 2012