NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF SCIENCES
COMPUTER SCIENCE PROGRAM

BQU01 – CHEMISTRY I

I. GENERAL INFORMATION

CODE	**:**	BQU01 Chemistry I
SEMESTER	**:**	1
CREDITS	**:**	5
HOURS PER WEEK	**:**	6 (Theory – Practice)
CONDITION	**:**	Mandatory

II. COURSE DESCRIPTION

The course provides students the knowledge of the fundamental concepts and principles of chemistry for the analysis of the composition, structure, properties and physical and chemical changes of matter. It includes the study of atoms, how they form chemical bonds to create chemical compounds, as well as the interactions between substances through chemical reactions to form different substances. Students also carry out stoicheometry calculations, analyze electrochemical reactions and the chemical equilibrium in compounds and substances. Laboratories experiences are carried out to verify the validity and applicability of chemistry laws and principles. Chemistry problems with engineering applications are analyzed and solved.

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 reactions and transformations.
5. Analyze, interpret and perform stoichiometric calculations and basic math tools such as: exponential, logarithmic, Etc.
6. Understand electrochemical processes and the generation of electricity through chemical reactions.

IV. COURSE CONTENTS

1. MATTER AND ATOMIC STRUCTURE

Matter / Physical and Chemical Properties / States, changes of state / Classification: mixtures and pure substances / Introduction to the structure of the atom / Electromagnetic Radiation / Planck's Quantum Theory / Photoelectric effect / Bohr Model / Louis De Broglie Equation / Spectrum of H2 / Quantum mechanics, energy levels / Orbital / Electronic configuration of the atom.

2. PERIODIC TABLE AND CHEMICAL BOND

Periodic Table and classification / Periodic Properties: atomic radius, ionization energy, electron affinity / Chemical Bond / Lewis Structure / Octet Rule / Parameters of chemical bonds, energy, length, bond angle / Bond types: ionic, covalent, metallic / Solid State / Amorphous solids, crystalline solids / Classification: ionic, covalent metal / Properties: conductors, semiconductors, insulators.

3. FUNCTIONS AND CHEMICAL REACTIONS

Valence / Oxidation number / Chemical features: oxides, hydroxides, acids, salts / Inorganic nomenclature / Chemical reactions and types of chemical reactions / Balance of redox reactions by changes in oxidation number.

4. STOICHIOMETRY

Key concepts / Gram-atom / Atomic weight / Formula weight / Mole / Avogadro's number / Equivalent weight / Molar volume / Proximate composition / Stoichiometric ratios: weight-weight, mole-mole, weight-volume / Purity / Percentage yield / Limiting reagent.

5. ELECTROCHEMISTRY AND SOLUTIONS

Definition / Electrochemical processes / Galvanic cells / Standard hydrogen potential / Table of potential / potential of cells / Primary and secondary batteries / Electrolysis / Electrolytic cells / Faraday laws / Electrochemical corrosion / Nature of Solutions / Components / Types of solutions / Concentration units: physical and chemical / Dilution / Arrehnius acids and bases / Neutralization.

6. CHEMICAL EQUILIBRIUM AND CHEMICAL ELEMENTS

Reversible reactions / reaction speed / Guldberg and Waage and the law of mass action / Chemical Balance / Kc / Ionization of water pH and pOH / Strong electrolytes / Chemical elements: aluminum, carbon, silicon, germanium and copper / Collection / Physical and chemical properties / Alloys / Applications.

V. LABORATORY AND PRACTICE

Laboratory 1: Mixture and combination
Laboratory 2: Study of flame
Laboratory 3: Periodic table
Laboratory 4: Chemical bonds and chemical reactions
Laboratory 5: Redox reactions
Laboratory 6: Stoichiometry
Laboratory 7: Electrochemistry

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, 2010
2. CHANG RAYMOND
   Chemistry
   McGraw-Hill Editorial, 2012