# NATIONAL UNIVERSITY OF ENGINEERING
# COLLEGE OF CHEMICAL AND TEXTILE ENGINEERING
# CHEMICAL ENGINEERING PROGRAM

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# QU214 – INORGANIC CHEMISTRY

## I. GENERAL INFORMATION

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| **CODE** | **:** | QU214 Inorganic Chemistry |
| **SEMESTER** | **:** | 3 |
| **CREDITS** | **:** | 4 |
| **HOURS PER WEEK** | **:** | 4 (Theory – Practice) |
| **PREREQUISITES** | **:** | QU118 Chemistry II, QU119 Laboratory of Chemistry II |
| **CONDITION** | **:** | Compulsory |

## II. COURSE DESCRIPTION

The course prepares students for the understanding and analysis of inorganic matter state since its most basic structure to more complex states and structures. Students understand atom structure, internal energy, metals and non-metals according to their grouping in the Periodic Table. Students also apply physical and chemical methods for analyzing the properties and structure of inorganic elements and compounds. The corresponding laboratory experience is completed in course QU215 Laboratory of Inorganic Chemistry.

## III. COURSE OUTCOMES

1. Understand the components, structure and behavior of atoms, as well as their nuclear stability, nuclear link energy and periodic properties.
2. Understand and differentiate the properties and characteristics of the elements of the Periodic Table.
3. Understand the formation of inorganic compounds from the characteristics of their elements.
4. Understand and apply the physical and chemical methods for the analysis of inorganic elements and compounds.
5. Identify potential research areas on the structure, bond links and reactivity in the synthesis of inorganic compounds.

## IV. COURSE CONTENTS

### 1. INTRODUCTION AND CONCEPTS

Introduction / Evolution of inorganic chemistry / Atom structure / Isotopes / Nuclear stability / Nuclear bond-link energy / Radioactivity / Radioactivity disintegration / Quantum mechanics and atom vector model / Atom periodic properties / Effective nuclear charge / Slater rule / Stoichiometry of aisled molecule / Molecular symmetry.

### 2. INORGANIC SOLID STATE

Nature of inorganic solids / Crystalline solid classification according to their internal structure / Ionic model / Crystalline network energy / Metal links / Bands theory / Semiconductors / Optical and mechanical applications / Instrumentation and physical and chemical techniques in inorganic analysis / Zeolites. Classification, properties and applications.

**3. ACID-BASE SYSTEMS AND NON-AQUEOUS SOLVENTS**

Acid-base systems / Properties / Solvents classification / Aqueous and non-aqueous solutions / Lewis acid and bases / Pearson, Lux Flood, Franklin and Gutman / Reduction potentials and their application to Latimer, Frost Pourbaix diagrams / Ellingham diagrams.

**4. REPRESENTATIVE ELEMENTS- NON-METALS**

Hydrogen / Natural state / Production / Properties / Applications / Hydride / Ionic compounds.
Noble gases / Production / Natural state / Properties / applications.
Seventeen group elements / Halogens / Chlorite / Production / Natural state / Properties / Applications.
Sixteen group elements / Oxygen and ozone / Production / Natural state / Properties / Applications / Water / Sulfur.
Fifteen group elements / Nitrogen / Production / Natural state / Properties / Applications / Phosphorus.
Fourteen group elements / Carbon / Production / Natural state / Properties / Applications / Silica.

**5. GROUP I AND II METALS**

Metals. Natural state. Classification. Metallurgical processes / Group I and II metals. Production, Properties. Applications / Post-transition metals. Aluminum, Tin and Lead. Production, Properties. Applications.

**6. TRANSITION METALS**

Properties, and technological and economic importance / First series elements: Cr, Fe, Co, Ni, Cu. Production. Natural state. Properties. Metallurgy. Applications / Second series elements: Mo, Pd, Ag / Third series elements: W, Pt, Au / Bridge group: Zn, Cd, Hg.

**7. COORDINATION COMPOUNDS**

Introduction / Coordination structure and number / Nomenclature / Stereoisomery and coordination compound stability / Coordination compound links.

## VI. METHODOLOGY

The course consists of theory and practice. The instructor presents the concepts and principles of inorganic chemistry using applets and videos. Problems related to engineering are solved with active student participation. At the end of the course, students submit and defend a bibliography searching report on a theme of the course. Student active participation is promoted.
Laboratory experiences are carried out in course QU215 Laboratory of Inorganic Chemistry

## 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 grade of practice work

## VIII. BIBLIOGRAPHY


1. **SHIVER and ATKINS**
   Inorganic Chemistry
   Mc Graw Hill Editions, 2010
2. **MIESSLER Gary**
   Inorganic Chemistry
   Prentice Hall Editions, 2012