NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF GEOLOGICAL, MINING AND METALLURGICAL ENGINEERING
GEOLOGICAL ENGINEERING PROGRAM

GE282 – GEOCHEMISTRY

I. GENERAL INFORMATION

CODE	: GE282 Geochemistry
SEMESTER	: 7
CREDITS	: 3
HOURS PER WEEK	: 5 (Teoría - Práctica - Laboratorios)
PREREQUISITES	: GE153, FI565
CONDITION	: Mandatory

II. COURSE INTRODUCTION

The course prepares the student for the systematic study of the origin, evolution and transformation of the elements and chemical compounds in the geological processes, as well as to establish the laws that govern the migration and distribution of the elements on Earth manifested in their geochemical cycles, as Fundamental basis for explaining the genesis of geological events.

III. COURSE OUTCOMES

The student:

1. Organizes the geological processes for their physical-chemical analysis.
2. Explains the transformations undergone by minerals and rocks by suppressing and endogenous agents.
3. Understands chemical reactions in geochemical environments.
4. Interprets field observations based on geochemical criteria
5. Constructs geochemical models to explain the genesis of minerals and rocks.
6. Recognizes factors influencing geological events
7. Analyzes the distribution and abundance of elements on Earth based on geochemical cycles.

IV. LEARNING UNITS

1. GEOCHEMISTRY AND GEOCHEMICAL CLASSIFICATION OF THE ELEMENTS / 6 hours

Definition of geochemistry, evolution, division of geochemistry, methodology of work./Origin of elements - Cosmic abundance of elements - primary differentiation of elements on Earth / Geochemical classification of elements.

2. GEOCHEMISTRY OF SEDIMENTARY ROCKS / 9 hours

Geochemistry of sedimentary rocks / Geochemical reactions of silicates, sulphides, carbonates, gases and organic matter in the environment Supergen / Mobility of elements in supergene environments / Mobility and precipitation of metals as a function of pH, solubility of H2S, H2CO3, SiO2, H3PO4 in Geochemical differentiation during sedimentation / mobility of elements as a function of pH-Eh and thermodynamics, Usiglio's experiment and geochemical processes of sedimentary differentiation.

3. METAMORPHISM GEOCHEMISTRY / 3 hours

Geochemistry of metamorphism / Thermodynamics of metamorphism / Experimental cases on metamorphic reactions / Metamorphic phases as a function of pressure-temperature.

4. GEOCHEMISTRY OF IGNEAS ROCKS, HYDROTHERMAL FLUIDS AND FLOW INCLUSIONS / 9 hours

Geochemistry of igneous rocks, origin of magmas, magmatic differentiation with formation of hydrothermal fluids, volcanic gases, magmatic sublimates, chemical composition of rocks. / Geochemical interaction of rocks with hydrothermal fluids, Hydrothermal geochemical reactions, chemical and mineralogical changes by hydrothermal fluids. Geochemistry of fluid inclusions, trapping and stability of fluid inclusions, types and chemical composition of fluid inclusions, characteristics of fluid inclusions during migration and mineralization processes.

5. ISOTOPIC GEOCHEMISTRY / 6 hours

Geochemistry of radioactive isotopes in dating and differentiation of magmas and rocks, applications cases. / Geochemistry of stable light isotopes, isotope fractionation, cases and applications of hydrogen, oxygen, carbon and sulfur./

6. GEOCHEMICAL CYCLE OF ELEMENTS / 3 hours

Geochemical cycle of elements in the Earth - Process of the geochemical cycle - Types of geochemical cycles - Average abundance of elements in the rocks during a geochemical cycle.

V. LABORATORY AND PRACTICAL EXPERIENCES

Laboratory 1: Introduction and geochemical reactions / Geochemical distribution of elements.
Laboratory 2: Recognition of sedimentary geochemical environments / Mobility of elements in supergenes environments**.**
Laboratory3: Mobility of the elements-pH-Eh Graphs / Metamorphic geochemical reactions.
Laboratory4: Distribution of elements in igneous environments / Characteristics of hydrothermal fluids / Characteristics of fluid inclusions.
Laboratory5: Isotope applications in geochemical environments.
Laboratory6: Experimental development of geochemical cycle / Methodology for practical work on the construction of the geochemical cycle of an element in rocks - Interpretation and applications.

VI. METHODOLOGY

The course is developed in sessions of theory and personal and group practices, so that the student understands the fundamentals of the mobility of elements on Earth, perform experiments to associate them with geochemical environments, make partial and global measurements and interpretations; And to construct a geochemical cycle.

VII. GRADING FORMULA

Evaluating System: “G”. Calculating the Final Average: PF= (EP+EF+PP)/3
EP: Mid-term Exam, EF: Final Exam, PP: Average of practices.

VIII. BIBLIOGRAPHY

1. KRAUSKOPF, K. B. (1967). Introduction to geochemistry. McGraw, New York, N. Y.
2. BRIAN MASON., (1960). Principios de Geoquímica. Ed Omega, Barcelona