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

GE323 – DESCRIPTIVE MINERALOGY

I. GENERAL INFORMATION

CODE	**:**	GE323 Descriptive Mineralogy.
SEMESTER	**:**	5
CREDITS	**:**	4
HOURS PER WEEK	**:**	6 (Theory–Practice)
PREREQUISITES	**:**	GE413 Crystallography
CONDITION	**:**	Compulsory
DEPARTMENT	**:**	Mining Engineering

II. COURSE DESCRIPTION

This course prepares students for the identification of different types of mineral species pointing to explain the genesis of rocks and mineral deposits, as well as to understand the intergrowth patterns of minerals for carrying out their optimal separation. Students will use actual samples for identifying minerals and determining their physical parameters.

III. COURSE OUTCOMES

At the end of the course, students:

1. Integrate information obtained from ore samples (physical properties), and evaluate different identification alternatives to select the most appropriate to the application.
2. Classify ore samples applying theoretical and practical fundamentals of mineralogy, also draft and present mineralogical technical reports.
3. Explain mineralogical assemblages found in the field by the use of main mineral stability diagrams.
4. Analyze and explain the physical properties of minerals based on their molecular structure.

IV. LEARNING UNITS

1. INTRODUCTION AND MINERAL DEPOSITS I

Methodology / Qualification systems / Basic concepts / Mineral species / Solid solution / Polymorphism / Idiomorphism / Reversible and non-reversible inversion / Geological occurrence / Review of mineral deposit types I.

Silicates. Characteristics / Structural classification.

Nesosilicates. Olivine, Andalusite family (kyanite, sillimanite), topaz, zircon, titanite, garnet family, dumortierite

Sorosilicates. Hemimorphite, epidote family (zoisite, allanite) and vesuvian.

Cyclosilicates. Tourmaline and beryl.

2. INTRODUCTION AND MINERAL DEPOSITS II

Inosilicates. Pyroxenes and amphiboles: augite, diopside, aegirine, spodumene, Jadeite, enstatite, hypersthene, rhodonite, wollastonite, tremolite, actinolite and horblenda.

Phyllosilicates. Structural arrangements, kaolin, serpentine, montmorillonite, talc, pyrophyllite, chrysocolla, muscovite, biotite, phlogopite, lepidocrocite and chlorite family.

Tectosilicates. Quartz varieties, opal, feldspars, orthoclase, plagioclase, feldespatoids, scapolite and zeolite family.

3. SULFITES AND SIMILAR COMPOUNDS I

Characteristics / Structural classification / Pyrite Mmrcasite, pyrhotite, bravoite, pentlandite, sphalerite, wurtzite, brunckita, greenockite, galena, arsenopyrite, stibnite, bismuthinite, alabandite, cinnabar, realgar, orpiment, molybdenite and acanthite.

4. SULFITES AND SIMILAR COMPOUNDS II

Chalcocite, digenite, covellite, chalcopyrite, bornite, gray copper family, enargite family, Arsenides: nickelite, sulfosalts from lead and sulfosalts from silver.

5. NATIVE ELEMENTS

Metallic: Au, Ag, Cu, Hg and platinoids / Semi-metallic: As, Sb, Bi / Non-metallic: graphite, diamond and sulfides / Halides: Halite, sylvite, chlorargyrite, bromargirita, fluorite and atacamite / Oxides and hydroxides: ice, cuprite, tenorite, corundum, hematite, magnetite, ilmenite, spinels family, rutile, cassiterite, uraninite, pyrolusite, hydroxides: bauxites, limonite and psilomelane.

6. SULFATES

Anhydrous and hydrated, barite, celestite, anglesite, anhydrite, gypsum, halcantite, melanterite, goslarite, epsomite, jarosite and alunite / Wolframates: Scheelite and wolframite / Phosphates, Arsenates, Vanadates: apatite, monazite, xenotimo, lazulite, pyromorphite, mimetesite, vanadinite, turquoise, vivianite, erythrite and uranium / Borates: Borax and ulexite.

V. LABORATORY AND PRACTICAL EXPERIENCES

1. Session 1: Nesosilicates, Sorosilicates, Cyclosilicates, Inosilicates, Phyllosilicates and Tectosilicates.
2. Session 2: Sulfides and sulfates.
3. Session 3: Native elements, halides, oxides and hydroxides, carbonates and sulfates, wolframites, nitrates, borates, phosphates, arsenates, vanadates.

VI. METHODOLOGY

The course takes place as follows:

- Three-hours weekly session with faculty presenting theory fundamentals.
- Three-hours weekly session of Cabinet work, where students analyze rock samples for determining the physical properties of minerals for their classification and identification.
- Daily free Cabinet work by students to complete work assignment on minerals identification and classification.

In all activities, students participate actively and there is continuous feedback from faculty. At the end of the course, students submit and defend a research report.

VII. GRADING FORMULA

The Final Grade PF is calculated as follow:

PF = PP

PP: Average of Laboratory and Practical Works

VIII. BIBLIOGRAPHY

1. KLEIN CORNELIS. HURLBUT CORNELIUS.
   Dana's Mineralogy Manual. Volume 2, Fourth Edition, Reverte Editorial, 2015.
2. MUKHERJEE SWAPNA.
   Applied Mineralogy, Applications in Industry and Environment, Springer Editorial, 2011.