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

GE701 – MINERAL DEPOSITS

I. GENERAL INFORMATION

CODE	**:**	GE701 Mineral Deposits
SEMESTER	**:**	7
CREDITS	**:**	3
HOURS PER WEEK	**:**	5 (Theory–Practice–Field)
PREREQUISITES	**:**	GE153 Petrology
CONDITION	**:**	Mandatory
DEPARTMENT	**:**	Geological Engineering

II. COURSE DESCRIPTION

The course prepares students in the application of the concepts, methods and techniques for the analysis of ore deposits, describing and interpreting the geological and geochemical processes involved in the genesis of metal ore deposits. The methods are applied for identifying the genesis models of metal deposits, as well as for analyzing the geological characteristics and classification of the genesis of the most important ore deposits in Peru and the world.

III. COURSE OUTCOMES

At the end of the course, students:

1. Explain the models and types of metal ore deposits, as well as their genesis characteristics.
2. Understand the geological and geochemical processes involved in the genesis of metal ore deposits.
3. Interpret the geological, geophysical and geochemical conditions in the formation metal ore deposits.
4. Construct genesis models of metal ore deposits.
5. Recognize the mineralogy, textures, alterations and para-genesis of different types of metal ore deposits.
6. Analyze bibliography, field and laboratory information for interpreting the origin of metal ore deposits.

IV. LEARNING UNITS

1. INTRODUCTION

Ore deposits from petrologic, mineralogical, geochemical, thermodynamical and mathematical point of view / Genesis of minerals and economic geology.

2. MAFIC AND ULTRAMAFIC ORE DEPOSITS

Magmatic segregation and injection / Proterozoic and archaic deposits in ultramafic complex (Bushveld – South Africa) / Chrome and platinoid deposits (Cr-EGP) / Ophiolites complex deposits Alps (Podiform) / Ferrous deposits (Kiruna-Sweden) / Ni-Cu-Fe sulfides EGP (Sudbury-Canada) / Kimberlite-Lamproite (diamonds) related ore deposits / Carbonatite Nb-Ta, Palabora type Cu-P-Fe-REE related ore deposits and Anortositic complexes Fe-Ti (Lac Tio – Canada).

3. ORE DEPOSITS ASSOCIATED TO INTERMEDIATE PLUTONIC AND ACID ROCKS

Pegmatitic ore deposits / Genesis, geological characteristics, classification and zoning of ore with economic relevance (Be, ta, Sn, W, Pb, Cs, Nb, U, Th) / Greisen type deposits Sn-W / Sn deposits in albitites (Plateau-Nigeria and Rondonia-Brasil).

4. MAGMATIC-HYDROTHERMAL DEPOSITS ASSOCIATED TO IGNEOUS ROCKS

Porphyry-type intrusive igneous rocks: Cu (Chuquicamata-Chile), Mo (Climax type), Sn (Llallagua-Bolivia), W-Mo (Mount Plesant – Canada / Skarn type deposits. Models, geological characteristics, genesis, evolution, zoning. Classification: Fe, Cu, W, Sn, Au, Pb-Zn / Gold meso-thermal deposits / Sn band in Peru-Bolivia / Precious metals epi-thermal deposits (Au, Ag) associated to sub-aerial volcanism / Hg, Sb and S epi-thermal deposits.

5. SUBMARINE VOLCANISM AND SEDIMENTATION RELATED DEPOSITS

Actual systems / Classification / Complex sulfides Cu-F, Cyprus type Cu, kuroko Zn-Pb, Besschi Cu-Zn, RioTinto (Piritica-Spain) / IOCG-type deposits- Typology and classification.

6. SEDIMENTARY ENVIRONMENTS RELATED DEPOSITS

In distensive basins Red Sea type / Black lutite related deposits Cu-(Ag,Zn,Pb,Co), Kupferchiefer and Copperbelt type / Carbon rock – associated deposits Zn-Pb-Ba-F, Mississippi type, Silesia type, Ireland-type / Sedex type deposits, stratiform Pb-Zn-(Cu) in detritic sequences (Sullivan-Canada, Mont Isa, McArthur-USA) / Cupper clastic sediment associated deposits / Chemical sediments associated deposits / Mn-(Ni, Cu, Co) nodules in sea bottom / Placer deposits (Au, Sn, diamond and heavy metals) / Au paleo-placers Witswaterrand type.

7. EXOGENOUS PROCESSES RELATED DEPOSITS

Ni-(Co) residual deposits (New Caledonia), Mn residual (Morro da Mina, Brasil), Fe residual laterites (Conakry-Guinea), Ti residual and REE Mount Wled-Australia / Supergenic enrichment related deposits. Lixiviation, re-movilization and precipitation models: in porphyry (Globe Arizona – USA), Ag reefs (Chanarcillo-Chile), massive sulfides (Rio Tinto-Spain) / Exotic deposits of Cu (La Exotica-Chile).

8. RADIACTIVE ORE DEPOSITS OF U-Th

Associated to alkaline igneous rocks (Kola Peninsula) / Associated to acid rocks (Marcgnac-France) / Associated to volcanos (Macusani-Peru) / Associated to sedimentary rocks “roll front” (Wyoming-USA).

9. METAMORPHIC DEPOSITS

Orogenic Au associated to greenstone belt.

VI. METHODOLOGY

The course is carried out in theory, practical, laboratory and field sessions. In theory sessions, the instructor introduces theory, concepts and applications of advanced models on the genesis of metal ore deposits. In practical sessions, several problems are solved and their solution is analyzed. In laboratory sessions, students analyze and describe diverse types of metal ore deposits and interpret their genesis processes. In field sessions, students visit geological fields for recognizing and interpreting the genesis of the deposit. Students active participation is promoted.

VII. GRADING FORMULA

The Final Grade PF is calculated as follow:

PF = (EP + EF + PP) / 3

EP: Mid-term Exam EF: Final Exam
PP: Average of 6 practical works.

VIII. BIBLIOGRAPHY

1. Gilbert J. & Park Jr. Ch.
   The Geology of Ore Deposits. U.S.A., 2011
2. Hutchinson Ch.
   Economic Deposits and Their Tectonic Setting. U.S.A, 2012.
3. Robb L.
   Introduction To Ore Forming Processes. Australia, 2015.