

Semester VI

Paper No- 15: Economic Geology

Ores, gangue minerals, tenor, grade and lodes.

Resources and reserves

Economic and Academic definitions: Mineral occurrence; Mineral deposit; Ore deposit.

Historical concepts of ore genesis: Man's earliest vocation, Mining. Plutonist and

Neptunist concepts of ore genesis. (1 lecture)

Field aspects of the study:

Remote sensing, geophysical explorations, geochemical exploration, and geological studies: mapping at different scales, drilling, borehole logs and transverse sections.

(1 lecture)

Mineral Exploration: Surface and subsurface exploration methods, sampling and

assaying. Assessment of grade. Reserve estimation. (2 lectures)

Structure and morphology of different types of ore deposits:

Concordant and discordant ore bodies (1 lecture)

Endogenous processes:

Magmatic concentration, pegmatites, contact metasomatism, skarns, greisens, porphyry deposits and hydrothermal deposits (Intracrustal and Exhalative deposits). (9 lectures)

Exogenous processes:

Chemical and bacterial precipitation; colloidal deposition; weathering products and residual deposits: oxidation and supergene enrichment; placer deposits; evaporation of brine and metamorphism as ore forming processes. (7 lectures)

Metallogenic provinces and epochs. (1 lecture)

Metallic ores: oxides of Fe, Mn, Cr, W and sulphides of Cu, Pb, Zn, metallogenic provinces and epochs. Important deposits of India including atomic minerals.

(7 lectures)

Nonmetallic and industrial rocks and minerals, their nature and distribution in space and time in India: refractory, chemical, fertilizer, cement, chemical and gemstone industry including building stones. (7 lectures)

12 rounds of student presentations will be arranged in Groups on different topics covered under Theory

Practicals (12 lectures)

Megascopic identification: Study of physical properties of ore forming minerals.

Oxides: Magnetite, Maghemite, Hematite, Martite, Goethite, Limonite, Psilomelane, Pyrolusite, Braunite, Chromite, Ilmenite, Columbite-tantalite, Cassiterite.

Megascopic identification:

Sulphides: Galena, Sphalerite, Pyrite, Pyrrhotite, Chalcopyrite, Bornite, Molybdenite, Realgar, Orpiment, Stibnite.

Microscopic identification: Distinction between a transmitted light and reflected light microscope; Study of optical properties of common ore forming minerals:

- Galena, Sphalerite, Pyrite, Pyrrhotite, Chalcopyrite.
- Magnetite, Hematite, Psilomelane, Pyrolusite.

Preparation of maps: Distribution of important ores and other economic minerals in India.

Proposed project titles (Extendable)

- Database of different metal distribution in India, such as Fe, Mn, Cr, Au, Pb-Zn, Cu
- Geological characteristics of different deposits of India, for example Hutti gold deposits, Rajpura-Dariba Pb-Zn deposits
- Criteria for underground and open cast mining

Suggested Readings

- Guilbert, J.M. and Park Jr., C.F. 1986. The Geology of Ore deposits. Freeman & Co.
- Bateman, A.M. and Jensen, M.L. 1990. Economic Mineral Deposits. John Wiley.
- Evans, A.M. 1993. Ore Geology and Industrial minerals. Wiley
- Laurence Robb. 2005. Introduction to ore forming processes. Wiley.
- Gokhale, K.V.G.K. and Rao, T.C. 1978. Ore deposits of India their distribution and processing, Tata-McGraw Hill, New Delhi.
- Deb, S. 1980. Industrial minerals and rocks of India. Allied Publishers.