

Unit I

Mining Geophysics: Economic minerals, their composition and physical properties. Geological environment for the ore deposition.

Processes of formation of mineral deposits, magnetic concentrations, hydrothermal, and metasomatic processes. Sedimentary deposits, supergene enrichment, metallic and non metallic mineral deposits. (16 Hours)

Unit II

Suitability of the gravity, magnetic, S. P., electrical resistivity, I.P., MIP, MMR, electromagnetic, VLF, AMT, AFMAG, radioactivity, seismic and other methods for mineral exploration. Advantages of time and frequency domain I.P. methods. Mineral discrimination by spectral I.P., suitability of the various geophysical methods for different geological environment. Direct and indirect location of mineralised zones.

Limitations of geophysical methods in mineral exploration, Results of airborne surveys in contrast to ground surveys. Role of well logging methods in mineral exploration. Synergistic applications. Case histories. (18 Hours)

Unit III

Petroleum Geophysics: Mode of occurrence of oil and gas; sedimentary rocks, local sedimentary rocks, regional sedimentary rocks, structural and stratigraphic traps, Migration and accumulation, secondary migration. Natural gas and oil occurrences in India. Sedimentary basins of India. Hydrocarbon potentialities.

Reservoir rocks classification, fragmental reservoir rocks, chemical reservoir rocks, marine and non marine reservoir rocks, oil field waters, physical properties of oil, reservoir, pressure and temperature, pressure gradient, elements of drilling and well completion drilling. (20 Hours)

Unit IV

Role of gravity and magnetic methods for delineation of oil bearing structures. Seismic techniques, formation and density velocities of gas bearing sandstones, pitfalls in structure interpretation, hydro-carbon detectability, Seismic resolution. Delineation of reservoir, different scales of seismic surveys at different stages of exploration programme, requirement of detailed analysis of seismic section leading to geological interpretation, seismic facies analysis and reef patterns, Direct indication of hydrocarbons. Delineation of sandy reservoirs, shaly reservoirs, carbonate reservoirs, Fractured cavernous and mixed types of reservoirs. Role of well logging in the delineation of pay horizons. (18 Hours)

Unit V

Ground water Geophysics: Occurrence of ground water in igneous, sedimentary and metamorphic formations.

Resistivity characteristics of geological formations - factors effecting.

Different types of aquifers and their geohydrological significance, exploration:

Resistivity methods, Hydrological significance of various resistivity techniques and resistivity data, Isoresistivity maps, their significance in hydrogeology application.

Application of resistivity techniques in locating aquifers, Mapping buried channels, Fresh Salt water interface.

Application of other geophysical techniques in groundwater exploration: Gravity, Magnetic and EM.

Evaluation of aquifer characteristics from well logging techniques - resistivity, density SP, radiation and sonic logging.

Application of Seismic refraction in ground water exploration using compressional and shear waves in shallow ground water investigations. (20 Hours)

Books:

1. Mineral Economics by Sinha, R. K. & L. N. Sharma.
2. Economic Mineral deposits by Janson, M. D. & A. M. Bateman
3. Courses in Mining Geology, Mining Geophysics by Arogyaswami, R. N. P., SEG Vol.
4. Lectures by Tarkhov, A. G. SEG, Hyderabad
5. Applied Geophysics by W. M. Telford et al.
6. Ground water Hydrology by D. K. Todd
7. Application of surface geophysics to groundwater investigations