ORE GEOLOGY AND MINING GEOLOGY

Unit I:

1. Concept of ore genesis, Mineralising fluids and their migration
2. Geothermometry and Fluid inclusion in ores
3. Mineral deposits associated with geosynclines and different types of plate margins
4. Controls of ore localization, Wall rock alteration
5. Paragenesis and zoning in mineral deposits. Metallogenic epochs and provinces with special reference to India

Unit II:

2.1 Classification of mineral deposits
   Controlling factors, form, size, texture, structure and characteristic minerals with suitable examples of the following processes:

2.2 Magmatic, Pegmatitic and Contact metamorphic
2.3 Hydrothermal, Cavity filling and Replacement, Hypothermal, Mesothermal, Epithermal, and Xenothermal
2.4 Sedimentary, Bacteriogenic, Volcanogenic and Evaporation
2.5 Residual and Mechanical Concentration

Unit III:

3.1 Controlling factors, form, size, texture, structure and characteristic minerals with suitable examples of the Oxidation and Supergene Enrichment, Regional and Thermal metamorphic processes
3.2 Geological environments mode of occurrence, genesis and distribution of the major world famous deposits of Iron, Gold, Copper and Lead-Zinc
3.3 Ore Microscopy - basic principles and concept, Physical, and optical properties of the ore minerals
3.4 Textures and Structures of the ore minerals
3.5 Paragenesis and their determination, Applications of Ore Microscopy

Unit IV:

4.1 Open Cast Mining
4.2 Basic Concepts and terminology, drilling and blasting in open pits
4.3 Advantages and limitations, geological and physiographic conditions for open pit mining
4.4 Open pit mining methods - Manual and mechanised, Glory hole, Kaolin mining
4.5 Bench mining
4.6 Alluvial mining

Unit V:

5.1 Underground Mining
5.2 Basic concepts and terminology, classification and choice of mining
5.3 Subsidence, rock bursts, mine supports
5.4 Open stopes, overhand and underhand stopping
5.5 Slicing, Caving, and Shrinkage stopping
5.6 Coal mining methods - Board and pillar, Long wall, Horizon and miscellaneous mining methods.

Books Recommended:

Arongasami, R.P.N., 1996: Courses in Mining geology.
Unit - I
1.1 A brief review of mineral deposits of India - their history and development. Surplus and deficiency positions in mineral sectors of the country.

Geological environments, mode of occurrence, genesis and distribution in India and uses with examples of the following metaliferrous deposits:

1.2 Iron
1.3 Manganese
1.4 Chromium
1.5 Titanium

Unit - II
Geological environments, mode of occurrence, genesis and distribution in India and uses with examples of the following metaliferrous deposits:

2.1 Copper
2.2 Lead and Zinc
2.3 Aluminium
2.4 Tin, Tungsten
2.5 Nickel, Molybdenum

Unit - III
Geological environments, mode of occurrence, genesis and distribution in India and uses with examples of the following:

3.1 Gold, Silver Beryllium, Magnesium Zirconium and related Rare Earths
3.2 Atomic energy minerals

Geological environments, mode of occurrence, genesis, distribution, specification, grades and industrial uses of the minerals used in following industries with special reference to India:

3.3 Glass, Ceramic and Refractory Electrical and Abrasives
3.4 Chemical Fertilizers, Cement and Building materials
3.5 Precious and Semi Precious stones

Unit – IV
Geology, mode of occurrence, and distribution of the following deposits of India with their grades and products:

4.1 Gondwana Coals
4.2 Tertiary Coals
4.3 Oil and gas fields of eastern India
4.4 Oil and gas fields of western India
4.5 Offshore oil and gas fields.

Unit – V
Mineral Economics
5.1 Concept and scope of mineral economics
5.2 National Mineral Policy
5.3 Mines and mineral legislation of India, law of international seabed
5.4 Conservation of minerals, strategic, essential and critical minerals
5.5 Mineral economics of common ore and economic minerals of India

Books Recommended

UNIT - I
Geological Exploration I

1.1 Definition and characteristic features, Scope of prospecting and exploration, surface and subsurface methods.
1.2 Guides for mineral search - physiographic, stratigraphic, lithological, mineralogical and structural guides.
1.3 Pitting, trenching, drilling for prospecting, diamond and churn drilling
1.4 Sampling methods - different methods of sampling, channel and bore hole sampling.
1.5 Ore reserves categories and estimation.

UNIT - II
Geophysical Exploration

Basic principles, field procedures, corrections, interpretations, applications and limitations of the following methods:

2.1 Gravity
2.2 Magnetic
2.3 Seismic
2.4 Electrical - self potential, resistivity and electromagnetic methods.
2.5 Radioactive

UNIT - III
Geochemical Exploration

3.1 Geochemical principles - Geochemical cycle, mobility, geochemical tracers, anomalies and background values.
3.2 Dispersion patterns - Primary, secondary
3.3 Geochemical surveys - Exploration sequence, sampling techniques of rock, soil, stream sediments, water, vegetation and vapour.
3.4 Field and laboratory analytical methods, treatment of geochemical data and preparation of geochemical anomaly maps.
3.5 Selected Indian case histories of geochemical exploration of Copper, Lead, Zinc, Nickel and Chromium.

UNIT - IV
Mineral beneficiation - I

4.1 Introduction, principles and economic justification of mineral dressing, properties of rocks and minerals as applied to mineral dressing.
4.2 Comminution part - 1 - Crushing
4.3 Comminution part - 2 - Grinding
4.4 Liberation, Sizing and Screening
4.5 Classification - Principles and mechanism, classifiers

UNIT - V
Mineral beneficiation - II

5.1 Gravity concentration and Heavy media separation
5.2 Magnetic and Electrical separation
5.3 Flotation methods - Principles and techniques

Flow sheets of following important ores and minerals:

5.4 Copper, lead-zinc, iron, manganese, chromite.
5.5 Gold, coal, beach sand, fluorite and limestones

Books Recommended
Arogyasami, R.P.N., 1996: Courses in Mining geology.
Unit - I Introduction and Basic Principles
1.1 Environment - Definition and Concept.
1.2 Basic Environmental problems
1.3 Environmental Geosciences - Fundamental Concepts
1.4 Geoscience factor in environmental planning

Unit - II Earth and its Environmental System
2.1 Conservation of matters in various Geospheres - lithosphere, hydrosphere, atmosphere, and biosphere.
2.2 Earth's thermal environment and season
2.3 Concept of ecology and ecosystem
2.4 General relationship between landscape, climate and biomass.

Unit - III Natural Hazards
3.1 Natural hazards - Nature, zoning, risk assessment and mitigation measures
3.2 Seismic and Volcanic hazards and their environmental impact
3.3 Landslides and subsidence and their environmental impact
3.4 River flooding and coastal hazards and their environmental impact

Unit - IV Pollution and Waste Disposal
4.1 Pollution of surface and subsurface water.
4.2 Behaviour of pollutants in riverine, lacustrine, estuarine, and marine environment
4.3 Air and Noise Pollution - nature and effects
4.4 Waste (solid, liquid, gases) - their impacts, disposal, management and control

Unit - V Environmental Health and Environmental Law
5.1 Geologic factors of environmental health.
5.2 Chronic diseases, and geologic environment - heart disease and cancer
5.3 Environmental Policy and Law
5.4 Environmental legislation in India.

Books Recommended
Bell, F.G., 1985: Geological Hazards, Rutledge.
Bryant, E., 1985: Natural Hazards, Cambridge University Press.
Smith, K., 1992: Environmental Hazards, Rutledge
Subramaniam, V., 2001: Textbook in Environmental Science, Narosa International