

MIPC3002 MINE PLANNING & ECONOMICS (3-0-0)

Course Objectives

To provide students with comprehensive knowledge of mine planning, economic evaluation, and optimization techniques for surface and underground mines. The course covers feasibility studies, pit design, production scheduling, mineral economics, and mine valuation, integrating technical and economic considerations for efficient mineral resource management and sustainable mining operations.

Module-I: (07 Hours)

Mine planning and its importance; an initial data collection checklist of mine planning, technical and economic information for planning, exploratory drills and interpretation of bore hole data, Stages of planning of new mines, Feasibility Report, Detailed project report, Clearances and Approvals for Mining Projects for mine plan – FC, EC, LA and others, Computer applications in mine planning & design.

Module-II: (11 Hours)

Concepts of stripping ratios. Geometrical considerations for design of surface mines: Pit geometry, Pit layouts – Mine access, pit expansion, and push back operation. Pit Planning and Design: Pit design and reserve estimation, Development of economic block model, cut-off grade and its estimation; Ultimate pit configuration and its determination – hand method, floating cone technique, Lerchs-Grossmann algorithm, Optimization of facility location. Production scheduling and equipment system selection – Production scheduling concepts, optimum mine size and Taylor's mine life rule, selection of equipment system, and scheduling. Design of haul roads- Geometrical, Structural, Functional, and Safety features.

Module-III: (09 Hours)

Underground metal mine planning- stope boundaries, selection of a stoping method, and economics of each stope, stope reserve, development, manpower, ore/waste handling, equipment, essential services, production scheduling, time and work study for improvement of production, Optimization of mine size (mine production capacity) based on techno-economic considerations.

Sizing of mine; Optimization of mine size (mine production capacity) based on techno-economic considerations; Equipment and face scheduling against targeted production using suitable software.

Mine closure planning: Initial, Progressive, and Final Mine closure Planning and its components; Auditing; Legal and Financial Aspects.

Module-IV: (09 Hours)

Introduction: Overview of the mineral industry in India, Economic importance of the mineral industry; mining economy, risky nature of the mining industry, Demand and Supply, Elasticity of Demand, National Mineral Policy. Mineral price and pricing: International monetary system, Factors affecting mineral price, kinds of price quotation, Mineral price index, Mineral prices. Evaluation of Mineral Deposits: Mineral resource concept, classification and estimation of ore reserves, applications of Geostatistics and different Kriging methods, Mine sampling: Definition, purpose and scope, methods: groove/channel sampling; Chip sampling; grab sampling; Bulk sampling; Application of statistical methods in sampling

Module-V: (09 Hours)

Mine Valuation - Different methods, Depreciation, Amortization, and Redemption of capital, Break-even chart, and inventory control. Investment Decisions - discounted cash flow methods, non-discounted cash flow methods, and the advantages and disadvantages of them.

Course Outcomes:

- CO1: Explain the stages of mine planning, feasibility studies, and regulatory clearances required for mining projects. (Understanding)
- CO2: Apply geometric and economic principles to design surface mine layouts, including pit configuration and haul road design. (Application)
- CO3: Analyze techno-economic factors for optimizing mine size, production scheduling, and equipment selection in underground mines. (Analysis)
- CO4: Evaluate mineral deposit valuation methods, demand-supply dynamics, and pricing factors in the mining industry. (Evaluation)
- CO5: Design mine plans and closure strategies using software tools, considering economic viability and sustainability. (Creation)

Books:

1. Open Pit Mine Planning and Design: W. Hustrulid, M. Kuchta, and R. Martin
2. Mineral economics: Development and management of natural resources by Oded Rudawsky.
3. SME Mining Engineering Handbook: H.L. Hartman.
4. Principles of Mine Planning: J. Bhattacharya.
5. Mine Planning for Coal: S. P. Mathur.
6. Planning Open-pit mines: PWJ Van Rensburg.
7. Mine and Mineral Economics: S C Roy & I N Sinha.
8. Mineral Economics: R.K. Sinha & N L Sharma.
9. The economics of mining: Thomas Arthur Rickard, Walter Renton Ingalls, Herbert Hoover, R. Gilman Brown.