

MN Mining Engineering

Section 1:	Engineering Mathematics
Linear Algebra: Matrices and Determinants; Inverse and Rank of matrix; Systems of linear equations; Eigen values and Eigen vectors. Calculus: Limit, continuity and differentiability; Partial Derivatives; Mean value theorems; Indeterminate forms and L' Hospital's rule; Maxima and minima; Taylor's theorem; Sequences and series; Fourier series. Vector Calculus: Gradient; Divergence and Curl; Line; surface and volume integrals; Stokes, Gauss and Green's theorems. Differential Equations: Linear and non-linear first order ODEs; Higher order linear ODEs with constant coefficients; Cauchy's and Euler's equations. Probability and Statistics: Probability: Joint, Conditional, Bayes' Theory; Descriptive Statistics; Sampling theory and hypothesis testing; Binomial, Poisson, exponential and normal distributions; Pearson Correlation and linear regression. Numerical Methods: Solutions of linear algebraic equations; Interpolation; Integration of trapezoidal and Simpson's rule; Single and multi-step methods for differential equations.	
Section 2:	Mining Geology, Mine Development and Surveying
Mining Geology: Minerals, Rocks and their Origin, Classification, Ore Genesis; Structural Geology. Mine Development: Methods of access to deposits; Underground drivages; Drilling methods and machines; Explosives and initiation system, blasting tools, blast design practices; ground vibration Mine Surveying: Levels and levelling, tacheometry, triangulation; Errors and adjustments; Correlation; Underground surveying; Curves and contouring; Photogrammetry; Theodolite, EDM, Total Station, GPS, Remote sensing and Astronomical survey.	
Section 3:	Geomechanics and Ground Control
Engineering Mechanics: Equivalent force systems; Equations of equilibrium; Two dimensional frames and trusses; Friction forces; Particle kinematics and dynamics; Beam analysis. Geomechanics: Geo-technical properties of rocks; Rock mass classification; Instrumentations and in-situ stress measurement techniques; Theories of rock failure; Stress distribution around mine openings; Subsidence; Slope and Dump stability. Ground Control: Design of pillars and supporting systems; Mine filling. Strata Control.	
Section 4:	Mining Methods and Machinery
Mining Methods: Surface mining: layout and haul road development, loading, transportation and mechanization, continuous mining systems; highwall mining; Underground coal mining: bord and pillar systems, longwall mining, thick seam mining methods, Underground metal mining: open, supported and caving stoping methods, stope mechanization, ore handling systems.	

Mining Machinery: Generation and transmission of mechanical, hydraulic and pneumatic power; Materials handling: wire ropes, haulages, conveyors, face and development machineries, hoisting systems, pumps; comminution methods and machinery, Rock-tool interaction and mechanical cutting.

Section 5: Surface Environment, Mine Ventilation and Underground Hazards

Surface Environment: Air, water and soil pollution: Standards of quality, causes and dispersion of contamination and control; Noise pollution and control; Land reclamation; EIA.

Mine Ventilation: Underground atmosphere; Heat load sources and thermal environment, air cooling; Mechanics of airflow, distribution, natural and mechanical ventilation; Mine fans and usage; Auxiliary ventilation; Ventilation survey and planning; Ventilation networks.

Underground Hazards: Mine Gases, Methane drainage; Underground hazards from fires, explosions, dust and inundation; Rescue apparatus and practices; Safety management plan; Safety data analytics; Mine illumination; Mine legislation; Occupational health and safety.

Section 6: Mineral Economics, Mine Planning, Systems Engineering

Mineral Economics: Mineral resource classification; Discounted cash flow analysis; Mine valuation; Mineral taxation.

Mine Planning: Sampling methods, practices and interpretation; Reserve estimation techniques: Basics of geostatistics and quality control; Optimization of facility location; Mine planning and its components, Determination of mine size and mine life; Ultimate pit design; Grade-tonnage relationship, ore dilution, recovery and cut-off grade; Equipment Selection.

Systems Engineering: Concepts of reliability; Reliability of simple systems; Maintainability and availability; Linear programming, transportation and assignment problems; Network analysis; Inventory models; Queuing theory.