SYLLABUS FOR MINING ENGINEERING (MN)

Engineering Mathematics

Linear Algebra:

Matrices and Determinants, Systems of linear equations, Eigen values and Eigen vectors.

Calculus:

Limit, continuity and differentiability; Partial Derivatives; Maxima and minima; Sequences and series; Test for convergence; Fourier series.

Vector Calculus:

Gradient; Divergence and Curl; Line; surface and volume integrals; Stokes, Gauss and Green's theorems.

Diferential Equations:

Linear and non-linear first order ODEs; Higher order linear ODEs with constant coefficients; Cauchy's and Euler's equations; Laplace transforms; PDEs - Laplace, heat and wave equations.

Probability and Statistics:

Mean, median, mode and standard deviation; Random variables; Poisson, normal and binomial distributions; Correlation and regression analysis.

Numerical Methods:

Solutions of linear and non-linear algebraic equations; integration of trapezoidal and Simpson's rule; single and multi-step methods for differential equations.

Mining Engineering

Mechanics:

Equivalent force systems; Equations of equilibrium; Two dimensional frames and trusses; Free body diagrams; Friction forces; Particle kinematics and dynamics.

Mine Development, Geomechanics and Ground Control:

Methods of access to deposits; Underground drivages; Drilling methods and machines; Explosives, blasting devices and practices.

Geo-technical properties of rocks; Rock mass classification; Ground control, instrumentation and stress measurement techniques; Theories of rock failure; Ground vibrations; Stress distribution around mine openings; Subsidence; Design of supports in roadways and workings; Rock bursts and coal bumps; Slope stability.

Mining Methods and Machinery:

Surface mining: layout, development, loading, transportation and mechanization, continuous surface mining systems; Underground coal mining: bord and pillar systems, room and pillar mining, longwall mining, thick seam mining methods; Underground metal mining : open, supported and caved stoping methods, stope mechanization, ore handling systems, mine filling.

Generation and transmission of mechanical, hydraulic and pneumatic power; Materials handling: haulages, conveyors, face and development machinery, hoisting systems, pumps.

Ventilation, Underground Hazards and Surface Environment:

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

Subsurface hazards from fires, explosions, gases, dust and inundation; Rescue apparatus and practices; Safety in mines, accident analysis, noise, mine lighting, occupational health and risk.

Air, water and soil pollution:

causes, dispersion, quality standards, reclamation and control.

Surveying, Mine Planning and Systems Engineering:

Fundamentals of engineering surveying; Levels and leveling, theodolite, tacheometry, triangulation, contouring, errors and adjustments, correlation; Underground surveying; Curves;

Photogrammetry; Field astronomy; EDM, total station and GPS fundamentals.

Principles of planning:

Sampling methods and practices, reserve estimation techniques, basics of geostatistics and quality control, optimization of facility location, cash flow concepts and mine valuation, open pit design; GIS fundamentals.

Work-study; Concepts of reliability, reliability of series and parallel systems.

Linear programming, transportation and assignment problems, queueing, network analysis, basics of simulation.