

Mining Engineering

DEGREE STANDARD

1. Mine Development

Exploration, Rotary and Percussive drilling, Diamond drilling, Drilling parameters, Directional drilling, Shaft sinking, Special methods of shaft sinking, Explosives and accessories, Drifting and tunnelling, Road heading and tunnel boring.

2. Mine Environment - I

Mine gasses - occurrence, properties, detection, measurement and analysis, Mine climate and control, Heat and humidity, Natural Ventilation, Distribution of air current in mines, Resistance of mine roadways, Mine illumination, Mine fans and their characteristics, Ventilation survey.

3. Mine Environment - II

Ventilation planning in mines, Noise, air and water pollution, Spontaneous heating, Mine fires, Explosions - causes, prevention and control, Inundation - causes, prevention and control, First aid in mines, Mine rescue and recovery.

4. Mining Machinery - I

Different types of motive power used in mines, Blasthole drills, Rope haulage, Wire ropes and their construction, safety devices, Locomotives - diesel, battery and trolley wire, safety devices, Shuttle cars, Load-haul-dumpers, Side dump loaders, Hydraulic transport, , Mine pumps and design, Distribution of electrical power in mines, Electrical layouts, Mine cables, Flame-proof and intrinsically safe apparatus, Mine communication.

5. Mining Machinery - II

Winding systems, Friction and drum winders, Multi-rope winding, safety devices, Winding accessories - headgear, head sheave, skips, suspension gear, shaft fittings etc., Surface and pit-bottom arrangements, Coal face machinery, Coal face haulage and conveyors, Condition monitoring of mining machinery.

6. Surface Mining - I

Suitability of surface mining and limitations, Cut-off grades, Pit limits, Stripping ratios, Design of pit slope, haul roads, benches, Pumping, Opencast mine development - different methods, Drilling and blasting - blast design, Earth moving machinery - shovels, draglines, continuous surface miners, bucket wheel excavators, dumpers etc., Placer mining and solution mining, Safety and environmental protection.

7. Surface Mining - II

Open pit optimisation, Output and man power planning, Quality control and conservation, Mine scheduling, Slope stability analysis, Productivity and maintenance of Heavy Earth Moving Machinery, Inpit crushing and conveying, Continuous surface mining, High angle conveying.

8. Underground Coal Mining

Choice of mining methods, Bord and pillar method - design and development, pillar extraction by caving and stowing using various techniques, supports, Longwall method - advance and retreat, shear and plough faces, Design of longwall workings, Thick seam mining, problems and special methods like gallery blasting, sub-level caving, horizon mining, contiguous, hydraulic mining, underground coal gassification.

9. Underground Metal Mining

Mine planning - exploration, development and stoping, Classification of mining methods, Methods of development - shafts, raises, winzes, drifts, bins, tunnels etc., Stopping methods - longwall, room and pillar, shrinkage, sub-level, cut and fill, block caving and combined, backfilling, Techno-economic

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analysis of mining systems, Extraction of remnant pillars, shaft pillars, Mining at great depths, Application of tunnelling and boring machines.

10. Mine Surveying

Principles of mine surveying, Developments in instrumentation and techniques, Underground surveying methods, Triangulation and Correlation, Preparation of mine plans and sections, Numerical problems, Modern surveying techniques, Photogrammetry and remote sensing applications, EDM and GPS.

Paper - II

1. Rock Mechanics

Stress analysis, Application of rock mechanics in mining, Physico-mechanical properties of rocks - laboratory and in situ testing, Engineering classification of rocks, Post-failure behaviour of rocks, Dynamic wave velocities and elastic constants, Time dependent properties of rocks, Theological modelling, Theories of failure of rocks, Rock mechanics instrumentation.

2. Ground Control

Mine supports - timber, steel, hydraulic, rock bolting, Roof examination, Design and selection of mine supports, Stowing - collection, preparation and transport of stowing material, different methods of stowing, underground and face arrangements, Design of underground workings and stress distribution, Design of pillars, Subsidence, Rock burst and bumps, Instrumentation.

3. Mineral Processing

Scope and objectives of mineral processing, Choice of methods, Sequence of operations, Comminution - crushing and grinding, Laboratory and industrial sizing, Different concentration techniques, Sampling and control, Special methods, Coal beneficiation - analysis of coal and grading, Generalised plant design and flow charts for important ores.

4. Environment and Ecology

Concept of environment and ecology, Landscape planning and analysis, Biosphere, Hydrosphere, Atmosphere, Nutrient cycling, Air, water, soil and noise pollution. Pollution standards and remedial measures, Blast vibrations in structures and equipment, Land reclamation dealing with mined out land, Tailings management and subsidence, Environmental impact assessment, Environmental management plans, Environmental audit, Environmental legislation.

5. Computer Applications in Mining

Microprocessors - input and output devices, Operating systems, Structured and object oriented programming, Database management systems, Programming for mine design problems, CAD in mining for opencast and underground mines, Management information systems, Digitisation and scanning, Artificial intelligence, Neural networks and virtual reality applications in mining.

6. Mine Management

History and development of mine management, Principles of scientific management, Functions of management, Organisation structure of a mine and a mining company, Time and work study, Balance sheet and profit and loss accounts, Manpower planning, Industrial relations, Trade union and workers participation in management, Industrial psychology, Operations research - linear programming, transportation, assignment, CPM and PERT.

7. Mine Economics

Role of mineral industry in national economy, National mineral policy, Conservation of minerals, Mineral policies, Royalty and taxation, Ore reserve estimation, Mine valuation, Pricing and sale of minerals, Marketing and inventory, Costing, Wages and incentives.

8. Mine Legislation and Safety

General provisions of mines and mineral regulation and development act, Mineral concession rules,

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Mines act, regulations and rules, bye-laws and circulars, Mines vocational training rules, Land acquisition, Explosives act, Indian electricity rules, Coal mine development and conservation act, Workmen's compensation act, Rescue rules, Mine accidents and occupational diseases, Accident statistics, Mine disasters in management, Safety audit and conferences.

9. Mine Planning and Design

Open cast mine planning - mine cuts, surface structures, division of mining areas into blocks, Underground mine planning, Location of mine entries, Optimisation of mining parameters, Planning of production capacities, Techno-economic analysis, Planning and selection of equipment, Preparation of mining projects - feasibility and detailed project reports, Sources of funding, Government policies.

10. Material Handling

Bulk handling machinery and systems, Different types of conveyors and their construction, Belt conveyors and their design and capacity, Hydraulic transport, Pneumatic transport, Aerial ropeways, Design and construction of silos and bunkers, Stacking and blending, Cranes and forklifts.