

MINING ENGINEERING

(DIPLOMA STANDARD)

SUBJECT CODE: 346

UNIT – I: MINE DEVELOPMENT

History of mining – contribution of mining in the human civilization and national economy, Indian mineral resources and world status – role of mining engineers in industry - mode of entries – applicability and limitations comparison of opencast vs underground mining and drilling methods –selection of drilling methods – flushing methods – exploration and production drilling – drilling in underground workings – variable affecting the performance of drilling – single tube, double tube and wire-line tube core barrels. Shaft sinking, election of shaft sinking including special methods and drifting by difficult methods including road headers and tunnel boring machines. Types of explosives and initiating systems-properties.

UNIT – II: MINE VENTILATIONS & ENVIRONMENTAL

Mine gases – detection – physiological effects and permissible levels, flame safety lamp, natural and mechanical ventilation - types of fans, their characteristics and fields of application, distribution of air current, ventilation devices, types of ventilation, computer based analysis of mine air distribution, auxiliary ventilation, installation of booster fans, ventilation surveys, continuous monitoring, mine fires - sampling & Interpretation of sample – spontaneous heating and firefighting, Mine explosions – types, causes and preventive measures, Methane drainage methods. Inundation in mines – dewatering of water logged areas, Burn side safety boring apparatus and water dams. Lighting in mines – methods, standards of lighting. Concept of ecosystem, biodiversity, green-house gasses – ozone depletion – air pollution and water pollution.

UNIT – III: MINING GEOLOGY

Details of Earth, earth quakes, volcanoes; mineralogy, megascopic properties of minerals; geo-tectonics; structural Geology: Geological features like faults, folds, etc., Stratigraphy and geological time scale – Physiographic divisions of India; Economic Geology: Different Prospecting Techniques: Reconnaissance; principles

and methods of prospecting – by pit, shaft, trench and boreholes; Coal and petroleum geology: origin of coal, coalfields of India, migration and accumulation of petroleum, distribution of oil fields in India.

UNIT- IV: UNDERGROUND MINING METHODS - COAL & METAL

Classification of coal seams, Bord and Pillar method - development, panel system, bord & pillar depillaring, mechanized method of development & pillar extraction, stowing methods, longwall advancing and retreating methods, mechanized longwall, salvaging and relocation, thick seam mining by slicing, blasting gallery method – sub level caving - horizon mining, hydraulic mining, underground gasification of coal, concepts of metal mining: development and stoping – conventional and mechanized drivage, classifications of stoping methods - supported and un supported – different stoping methods.

UNIT - V: MINING MACHINERY

Wire ropes – classification, selection, methods of deteriorate and their prevention, classification of mine transport systems – different types of rope haulages, haulage calculations, different types of conveyors including high-angle conveyors, locomotives & areal rope ways, mine pumps, selection of pumps, numerical problems on head, quantity, h.p of mine pumps, coal face machinery: like drills, power loaders, longwall face gate-roadway machinery – shearer, AFC, etc., flameproof, intrinsically safe apparatus and signalling winding, head gear, shaft fittings – guides, head gear pulleys, keps, detaching hooks, guides ropes, cage and skip winding, drum and friction winding, breaking in winding, mine cables.

UNIT - VI: SURFACE MINING

Overburden removal and disposal, design of waste dumps, bench parameters, haul roads, selection of equipment, different types of opencast equipment like excavators, transport (rail, road, conveyors) and ancillary equipment – stackers, reclaimers, opencast mine layouts, different types of explosives used, drilling blasting in opencast mines, fly rocks, air over pressure, controlled blasting, drilling and blasting in granite quarries, reclamation & mine closure plan, failure of slopes and various controlling and stabilization methods, safety in opencast mines, exploitation of coal

over developed coal pillars, in-pit crushing and conveying, high wall mining, introduction to hydraulicking, dredging, leaching, etc.

UNIT - VII: MINE MANAGEMENT, LEGISLATION AND GENERAL SAFETY

Mine organizational structure, ownerships of industries, organization, risks and rewards, recruitment and training, network analysis, CPM-PERT, Mines Act 1952, Mines Rules 1955, Coal Mines and Metalliferous Mines Regulations, DGMS technical Circulars, Indian electricity rules applicable to mines, VTC and rescue rules.

UNIT - VIII: ROCK MECHANICS AND STRATA CONTROL

Definitions, stress analysis, stress distribution around underground openings, relation between vertical and lateral stresses -induced stresses due to mining - principal plane, principal stresses, stress-diagrams, normal and shear and stress analysis in 2D, stress distribution around a mine workings , narrow and wider openings - Mohr's circle- simple numerical problems on stress analysis - Mohr's circle, physical & mechanical, properties of rocks and methods of determination, RMR, simple numerical problems for estimation of RQD, classification of roof rock based on RMR - tunnel quality index, rock behavior and stress measuring devices, theories of failure of rocks, mining subsidence, factors effecting subsidence, protective measures on surface and underground, supports, FER supports and supports during extraction, different types of powered supports.

UNIT - IX: MINE SURVEYING & MINERAL PROCESSING

Linear measurements, compass surveying, true meridian, magnetic meridian open & closed traverse, traversing with compass and chain, permissible errors, leveling — contouring and subsidence surveying, theodolite — temporary and permanent adjustments, permissible error for surface and underground and their distributions, correlation survey: tachometry, dip, strike, fault problems, EDM, GPS —DGPS, total station, introduction to remote sensing. Comminution, crushers — types of crushers, working principles and operation, comparison of crushing and grinding, grinding mills, industrial sizing, screening and classifiers, industrial screens, concentration, objectives and classification methods - sink and float technique, tabling, jigging, froth flotation.

UNIT - X: MINE PLANNING AND DESIGN AND COMPUTER APPLICATIONS IN MINING

Estimation of ore reserve based on bore hole data, design of mine openings, design of length of long wall face, design of opencast mines, optimum blast design, design of mine ventilation systems, pillar design problems, design of a pumping system for an u/g mine, design of support system in u/g mining, preparation of EMP of mines. Computer Engineering drawing principles, - Draw, Modify, Edit, View, Hatch, geometric constructions using CAD, drawing of simple geometrical shapes like circles, tangents, AutoCAD, Basic concepts of mine planning of stratified deposits using software like MINEX, MPD, etc. and other MPD software.
