MI-601 MINERAL PROCESSING

UNIT 1: COMMINUTION

Introduction, definition, scope and economic justification, main steps in ore dressing operations, comminution, crushing, principles of crushing , jaw crushers, gyratory crushers, cone crushers, roll crushers, gravity stamps their classifications and applications, grinding principles of grinding, application and classification of ball mills, rod mills, tube mills and Pebble mills.

UNIT 2: SIZING

Object of sizing, scale of sizing, laboratory sizing, screening and classification, different type of screens, their mode of operations and application and limitation, classification principles of classification, movement of solids through fluids, different types of classifiers, hydraulic and pneumatic classifiers, sampling-importance of sampling and methods used.

UNIT 3: GRAVITY CONCENTRATION

Jigging, flowing film concentrators like spirals and shaking tables, heavy media separation, applications and limitations of methods.

UNIT 4: FLOTATION

Physico-chemical principles, function of various flotation reagents, important machines, their principles, and working, flotation of sulphide, oxide and non sulphide ores.

UNIT 5: PROCESSING METHODS OF SOME COMMON MINERALS

Electrostatic and Magnetic Separation - Principle operation and field of application, Pelletisation of low grade iron ore, Drying and dewatering - thickening, filtration and drying. Coal washing; Simplified flow sheets for beneficiation of coal and typical ores of copper, lead, zinc, iron and manganese with special reference to Indian deposits.

REFERENCE BOOKS:

1. Ore Dressing by Gaudin
2. Ore Dressing by B. A. Wills

LIST OF EXPERIMENTS:

1. Study of Jaw crusher
2. Study of Roll crusher
3. Study of Grinding mills
4. Study of Akin’s classifier
5. Study of Shaking table
6. Study of Mineral jig.
7. Study of Spiral concentrator
8. Study of Floatation cell

9. Study of Thickners
10. Study of Washability curves

MI-602 MINING MACHINERY- II

UNIT 1: AERIAL ROPEWAYS

Different types, their constructions & installation, operation & maintenance, design calculation, their layout including rope-tensioning arrangements.

UNIT 2: CONVEYORS - I

Different types of belt conveyors, their construction, installation, maintenance & design.

UNIT 3: CONVEYOR - II

Shaker conveyor, scraper chain conveyor and armored chain conveyor, their installation & construction maintenance. Safety Devices; Pit top and pit bottom arrangements.

UNIT 4: SKIP & KOEPE WINDING

Skip types & construction, pit top & pit bottom arrangements, advantages and disadvantages, Types of Koepe Winder, Koepe wheel, Floating platforms, Two winders working in the same shaft, Winding with side by side and up and down sheaves, advantages and disadvantages. Multi-rope winding. Calculation of H.P.

UNIT 5: HYDRAULIC TRANSMISSIONS

Fundamental of hydrostatic compression, hydraulic fluids, hydraulic pumps, motors, cylinders and accumulators, different types of valves, hydraulic coupling and torque converters, Application in mines, Advantages of hydraulic transmission.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol I & Vol III by D. J. Deshmukh
2. Mining Machinery By S. C. Walker
3. Coal Mining Practice By Stathum

LIST OF EXPERIMENTS:

1. Study of Monocable aerial Ropeway.
2. Study of Bicable aerial Ropeway.
3. Study of Loop take-up and tensioning arrangement of a belt conveyor.
4. Study of pit top and pit bottom arrangements for a belt conveyor.
5. Study of Belt Conveyor
6. Study of an Armoured face Conveyor.
7. Study of Various Koepe Arrangements
8. Study of various types of skips.
9. Study of pit top and pit bottom arrangements for a Skip.

MI-603MINING ENVIRONMENT

UNIT 1: MINE ATMOSPHERE

Pollution in Mine Atmosphere, Mine Gases, Their Origin, Occurrence, Physiological effects and Detection, Calibration of Detectors, Methane Drainage. System for Monitoring of Mine Environment
by Tube bundle apparatus and Telemonitoring systems. Analysis of Mine air by Haldane Apparatus, Gas Chromatograph.

UNIT 2: HEAT AND HUMIDITY

Heat and Humidity in Mine Atmosphere, their Sources and Effects, Cooling Power of Mine Air, Assessment of Comfort Conditions, Air Conditioning of Mines, Surface, Underground and Divided Installations, Spot Coolers.

UNIT 3: THEORY OF VENTILATION

Objects and Standards of Ventilation, Flow of Air in Ducts and Mine Roadways, Resistance of Air Ways, Laws of Ventilation, Chezy's and Atkinson's Equations, Equivalent Resistance and Equivalent Orifice of Mine.

UNIT 4: MINE VENTILATION AND VENTILATION DEVICES

Natural Ventilation Pressure and its Measurements, Thermodynamics of Natural Ventilation, Distribution and Control of Air Current, Doors, Regulators, Stoppings and their Types, Air Crossings, Air Locks.

UNIT 5: FLAME SAFETY LAMPS AND MINE ILLUMINATION

Constructional details of Flame Safety Lamp, Gas Testing by Flame Safety Lamp, Types of Portable Lamps, their Maintenance and Examination, Lamp Room Design and Organization, Lighting from Mains, Photometry and Illumination Surveys, Standards of Illumination for Underground and Open
Cast Working

TEXT BOOKS:

1. Elements of Mining Technology by D.J. Deshmukh,Vol.II
2. Mine Environment & Ventilation by G.B. Misra

REFERENCE BOOKS:

1. Mine Ventilation,UMS
2. Subsurface Mine Ventilation, M. J. McPherson

LIST OF EXPERIMENTS:

1. Detection of presence and accumulation of Firedamp in mine atmosphere.

2. Detection of presence and accumulation of CO in mine atmosphere.
3. Study of various techniques of methane drainage
4. Study of surface air conditioning plant.
5. Study of underground air conditioning plant .
6. Study of different types of ventilation devices.
7. Study of cap lamps used in underground mine.
8. Study of Flame safety lamps used in underground mine.
9. Design of a cap lamp room for a large underground coal mine.

MI-604BLASTING TECHNOLOGY

UNIT 1 : COMMERCIAL EXPLOSIVES

Classification ,Low and High Explosive, Permitted and non permitted explosives, Important characteristics, ANFO, Slurry, Emulsion explosives, Primers and boosters, cast booster, Bulk explosive system.

UNIT 2: INITIATION SYSTEM, STORAGE AND TRANSPORTATION OF EXPLOSIVES

Detonators, safety fuse, Detonation cord, Detonating relay, Non-electric initiation system, NONEL, Electronic detonators, Exploder and other blasting tools, Magazines, transportation of explosives.

UNIT 3: SURFACE BLAST DESIGN

Theory of Breakage, Bench Blasting terminology, Estimation of Spacing, Burden, Stemming length, Sub-grade drilling etc., Charge calculation, initiation sequence, delay timing, Decking decoupling, Secondary Blasting.

UNIT 4: UNDERGROUND BLAST DESIGN

Terminology, cut holes, easers, trimmers, commonly used cut patterns, Wedge cut, drag cut, Pyramid cut, Burn cut, etc., blasting in sinking shaft, underground coal mine blasting, series and parallel connections of detonators.

UNIT 5: ENVIRONMENTAL IMPACT OF BLASTING

Blast induced ground vibration, its measurement, prediction and control, Noise, its measurements and control, Fly rock its causes and control, Controlled Blasting Techniques.

REFERENCE BOOKS:

1. Surface Blast Design by C.J. Konya.
2. Explosives and Blasting by G.K. Pradhan
3. Modern Techniques of Rock Blasting by U. Langefors and B. Kihlstrom.
4. Indian Explosive Act and Rules.
5. Engineering Rock blasting operations, Bhandari
6. Surface Blast Evaluation, N. R. Thote & Pradhan
7. Surface Blasting, P. Pal Roy

LIST OF EXPERIMENTS:

1. Measurement of ground vibration by seismograph
2. Development of predictor equation from the recorded data
3. Measurement of VOD by VOD mate and its analysis

4. Study of various fragmentation assessment techniques
5. Handling of WIPFRAG software
6. Design of blast for coal face
7. Design of blast for underground metal mine
8. Design of blast for bench blasting
9. Study of various blasting tools
10. Study of bulk explosive systems

MI-605 MINING ECONOMICS

UNIT 1: SAMPLING

Methods of sampling, Errors in sampling, analysis of samples, estimation of grade and reserves Different types of reserves. Salting, precautions against salting.

UNIT 2: MINE VALUATION

Different methods, Depreciation, Amortization and Redemption of capital, life and present value of a mine.

UNIT 3 : FINANCIAL MANAGEMENT

Methods of framing and financing industrial enterprises, Memorandum and articles of association, shares, debentures, dividends and interest. Break even chart and inventory control.

UNIT 4 :INVESTMENT DECISIONS

discounted cash flow methods, non-discounted cash flow methods, advantages and disadvantages of them, Internal rate of return, Net Present Value.

UNIT 5: BOOK KEEPING

Preparation of Balance sheet, Profit and Loss Account.

REFERENCE BOOKS:

1. Mineral Economics , R.T. Deshmukh
2. SME Handbook, Vol. I
3. Mineral Economics , Sinha and Sharma