MIC-501 SURFACE MINING

UNIT 1: OPEN PIT DESIGN AND LAYOUTS

Classification of surface mining method mineral deposits suitable for open pit mining, Important parameters of Open pit design; Design of Benches, Ultimate pit, Stripping ratio, Break even stripping ratio, Different methods of opening up the deposits; Box cuts, internal and external box cut, Methods of driving Box cuts; Layout of open pits; Layout of waste dumps, unit operations in opencast mining.

UNIT 2: ROCK DRILLING

Theory of Rock Drilling, Different Types of Drill Machines Used in Open Pits; Rotary, Percussive and Rotary Percussive Drilling, Selection of Drill Machines on the basis of Drill ability; Computation of Productivity of Drill Machines; Inclined Drilling; their Advantages and Disadvantages.

UNIT 3: PIT PREPARATION

Dozers, Scrapers, Front-End Loaders, Grader, Back Hoe, etc.; their Construction, Operation, Suitability and applicability; Calculation of Their Productivity

UNIT 4: LOADING AND EXCAVATION

Different Types of Excavators used in Open Pits; Shovel, Dragline, Hydraulic Excavators, Multi Bucket Excavators, their Construction, Specifications, Operation, Suitability and Applicability; Calculation of their Productivity.

UNIT 5: TRANSPORT IN OPEN PITS

Automobile Transport, Rail Transport and Conveyors; their Suitability; Computation of their Productivity; Automation in Open Pit transport such as Truck Dispatch System.

REFERENCE BOOKS:

1. Surface Mining: Pfleider
2. Mining Equipment: Boki
3. SME handbook: Hartman
4. Surface Mining Technology: S. K. Das

LIST OF EXPERIMENTS:

1. Study of open pit design and layouts
2. Study of loading and Excavation
3. Study of rock Drilling
4. Study of transport in open pits

MIC- 502 UNDERGROUND METAL MINING

UNIT 1: GENERAL

Status and scope of Underground metal mining methods; Definitions of important terms used in underground metal mining methods. Classification of mining methods; Factors affecting the choice of mining methods.

UNIT 2: DEVELOPMENT

Mode of access; Variables affecting the choice of mode of access; Crosscuts, Levels, Raises, Winzes, Ore passes; Their method of drivages with the description of various unit operations; Introduction to Raise boring and introduction to tunnel boring .

UNIT 3: STOPING METHODS-I

Overhand, Underhand and Breast stoping methods; Open stoping; Vertical Crater Retreat method; Sub level stoping Room and Pillar method, Resuing method.

UNIT 4: STOPING METHODS-II

Shrinkage stoping; Cut and fill stoping, Introduction to Square set stoping, Sub level caving, Block caving, Top slicing.

UNIT 5: SUPPORT SYSTEMS

Pillars; Back fill, Cable bolting, Steel Rock bolting, Grouting, Shotcreting etc. Code of timbering rules.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol II by D. J. Deshmukh
2. S M E Handbook
3. Underground mining methods, Hustrulid
4. Introduction to Mining, H. L. Hartman

LIST OF EXPERIMENTS:

1. Study of Underground metal mining methods.
2. Study of method of drivages
3. Study of Underhand and Breast stoping methods
4. Study of Cut and fill stoping methods
5. Study of Steel Rock bolting

MIC-503 MINE 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. Multirope 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

MIC-504 (A) - Pollution Control Engg.

UNIT-I

ENVIRONMENTAL POLLUTION Introduction and classification of environmental pollution, ecological conservation. Salient features of the environmental laws in India and Occupational disease. Environmental Impact Assessment, Environmental Management Plan, Environmental Audit.

UNIT-II

AIR POLLUTION Air pollution due to various gases and suspended particulate materials, causes, consequences, preventive measures, dust measuring equipment.

UNIT-III

NOISE POLLUTION Pollution due to noise and its consequences, noise produced by different machinery, control and safety, measurement of noise levels.

UNIT -IV

WATER POLLUTION Water pollution, its causes and preventive measures, acid-mine drainage, water pollution in mines and mineral beneficiation plants, water purification schemes in brief.

UNIT-V

LAND POLLUTION Land pollution and land reclamation, land reclamation techniques, Physical and Biological reclamation, Mine Closure Plan.

Reference Books:

1. Air & Water Acts.
2. Forest Conservation acts.
3. Legislation in Indian Mines - A Critical appraisal by Rakesh and Prasad.
4. Environmental Impact of Mining By Down and Stokes

MIC-504(B) COMPUTER APPLICATION IN MINING

UNIT 1: INTRODUCTION TO SOFTWARE PACKAGES APPLICABLE TO MINING

Computational systems inspired by natural evolution; natural and artificial evolution, evolutionary; chromosome representations; search operators;

UNIT 2: CO-EVOLUTION

Constraint handling techniques; niching and speciation; genetic programming; classifier systems and theoretical foundations; implementation of selected algorithms.

UNIT 3: DEVELOPMENT OF ALGORITHMS

Slope stability. Pillar design. Open pit configuration. Design of mine ventilation system. Optimisation of cycle of operations. Blast design.

UNIT 4 : SIMPLEX TECHNIQUE

Simplex technique for mining. Rock reinforcement design. Modelling of mining pollution phenomena. Management information systems.

UNIT5: DEVELOPMENT OF PROGRAMS

Simple computer programs based on the above algorithms.

REFERENCE BOOKS:

1. Fundamental of Database Systems by Elmasri & Navathe
2. Introduction to operations research by Hillier/Lieberman

MIC-505(A) ROCK MECHANICS

UNIT I

Application of rock mechanics in mining, Definition of important terms used in Rock mechanics, Classification of rock mass, Parameters of rock mass classification, Importance of rock mass classification, RQD, Q –system and Bieniskiwi's Geomechanics classification of rock mass.

UNIT II

Rock properties, Physico-mechanical properties of rock, Preparation and testing of specimen in the laboratory, ISRM standards, Determination of Physico-mechanical properties of rock as per ISRM standard testing procedures, Strength indices and their importance. Point load, Protodyaknov, Impact and Cone Indenter strength Index.

UNIT III

Rock as an elastic medium, Principle of elastic analysis, Rheological properties of rock, Importance of rheological models, Different types of rheological models, Dynamic properties of rocks, Anisotropy and Creep.

UNIT IV

Principal stress and Principal plane, Analytical method of determining the magnitudes and directions of normal and shear stress on failure plane, Mohr's circle, Theories of failure of rock, CoulombNavier theory, Mohr's theory, Griffith's theory, Empirical theories of failure of rock, Different modes of failure of rock.

UNIT V

Earth stresses, Importance of measurements of in situ stress, measurements of insitu stress by Flat jack, Overcoring and Hydraulic fracturing technique. Design of circular and elliptical openings. Determination of safe span of roof.

REFERENCE BOOKS:

1. Rock Mechanics By Obertabd Duvall
2. Rock Mechanics By Goodman
3. Rock Mechanics By Jager& Cook
4. Rock Mechanics by B.S. Verma

MIC-505(B) MINE MANAGEMENT

UNIT 1: EVOLUTION OF MANAGEMENT THEORY

Principle of Scientific management, Elements of management functions, Planning, Organizing and Control, Levels of Management. Structure and design of organization for mining enterprises.

UNIT 2: PERSONNEL MANAGEMENT

Selection, training and development of human resources, Job evaluation, job analysis, incentive and theories of motivation, Productivity, its concept and measurement, Leadership and Communication.

UNIT 3: PRODUCTION MANAGEMENT

Determination of norms and standards of operations by work study, work measurements, production planning, Scheduling and control, Queuing theory, short and long term planning, Quality control, introduction to MIS, Material Management

UNIT 4: INDUSTRIAL PSYCHOLOGY

Its relation with other branches of knowledge, studies of physical factors and their effect on man, Industrial relations, Human relations, trade union movements in India.

UNIT 5: INDUSTRIAL ACT AND LAWS

Industrial Dispute Act, Industrial Trade Union Act, Analysis of industrial disputes, Prevention and settlement of industrial disputes, Payment of wages act, Workmen's compensation act, Contract labour laws.

REFERENCE BOOKS:

1. Mine Management : V. N. Singh
2. Management & Administration : S.K.Gupta
3. Introduction to Management: O.P. Khanna

MIC-506 (A) MINE SAFETY ENGINEERING

UNIT 1:

Safety scenario in Indian mines., Safety management and organisation

UNIT 2:

Causes of accidents, accident report. ,Human behavioural approach in safety

UNIT 3:

Accident analysis and control.

UNIT 4:

Cost of accident., Emergency organisation for disaster management.

UNIT 5:

Systems engineering approach to safety, techniques used in safety analysis.

REFERENCE BOOKS:

1. Mines Act-1952 & Mines Rules-1955 L. C. Kaku.
2. Vocational Training Rules L. C. Kaku.
3. Mine Accidents S.J. Kejeriwal

MIC-506(B) DRILLING AND BLASTING OF ROCKS

UNIT 1: DRILLING OF ROCKS IN UNDERGROUND AND SURFACE MINES

Principles of rock drilling. Classification of drilling system. Rock drilling methods, parameters affecting the choice of drilling system, long hole drilling, ring drilling and rotary drilling methods for underground mines. Drilling bits.

UNIT 2: BLASTING IN UNDERGROUND MINES

Explosives. Initiation systems and accessories for blasting in the underground mines. Blasting off the solid. Blasting of cut faces. Mass-blasting system for heavy blasting in hard rock mines.

UNIT 3: BLASTING IN SURFACE MINES

Principles of blast round design for single and multi-row. Blast round design in surface mines. Bulk explosives Initiation systems and accessories.

UNIT 4: EVALUATION METHODS,

Evaluation of drilling and blasting methods for underground and surface mines by use of state-of-art techniques and gadgets.

UNIT 5: NUISANCES AND MITIGATION

Blasting nuisances and their mitigation for underground and surface mines.

REFERENCE BOOKS:

1. Elements of Mining Tech. Vol I,II,III by D. J. Deshmukh
2. Coal Mine Ground Control by Syd S Peng
3. Mining and rock construction technology