RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Mining and Mineral Processing, VI-Semester

MM- 601 Mining Environment - II

UNIT 1: VENTILATION SYSTEMS AND PLANNING
Calculation of pressure and quantity requirements, network problems, Hardy-Cross method, Ventilation planning and economic analysis, central and boundary ventilation, ascensional and descensional ventilation, antitropal, homotropal ventilation.

UNIT 2: MECHANICAL VENTILATION - I
Theory of mine fans, Types of mine fans, their characteristics & suitability, Process for selection of mine fans

UNIT 3: MECHANICAL VENTILATION - II
Auxiliary and booster fans, series and parallel operation of fans, fan drift and evasee, forcing and exhaust ventilation, fan reversal, ventilation in long headings.

UNIT 4: VENTILATION SURVEY
Object of ventilation survey, instruments for the measurement of pressure, velocity, and quantity of air.

UNIT 5: MINE DUST
Classification, physiological effects, measurement of dust concentration, dynamics of small particles, sampling of air borne dust, prevention and suppression of dust

Reference Books:
1. Mine Environment - G.B. Mishra
2. Elements of Mining Technology, Vol.2, D. J. Deshmukh
3. Underground Mine Environment, M. Mcpherson
4. Subsurface Mine Ventilation, H.L. Hartman

List of Experiments:
1. Study of installation of axial flow fan.
2. Study of installation of centrifugal flow fan.
3. Study of installation and positioning of booster fan.
4. Study of characteristic curve of different fans and their comparison
5. Study of principal and working of vane anemometer
6. Study of principal and working of velometer.
7. Study of principal and working of pitot tube.
8. Study of central and boundary ventilation system.
9. Study of gravimetric dust sampler
10. Study of thermal precipitator dust sampler

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Mining and Mineral Processing, VI-Semester

MM 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.
10. Study of hydraulic Couplings and Torque Converters.

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Mining and Mineral Processing, VI-Semester

Departmental Elective MM 603 (A) - Mining Legislation & Safety-II

01. Principal Provisions of Mines & Minerals (Regulation & Development) Act - 1957

02. Coal Mines Conservation & Development Act. - 1960

03. Mineral Concession Rules, Indian Electricity Rules related to mining activity.

04. Byelaws & D.G.M.S. Circulars.

05. Mines Rescue Rules - 1985

06.Mine Accident, their classification and analysis, Causes & preventive measures, Cost of accident, Preparation of Accident report, Court of Enquiry.

07. Safety Campaign, Causes of major mining accidents which occurred in India & Suggested remedial measures. National Safety Conferences.

Reference Books:

1. Legislation in Indian Mines (A critical Appraisal) Vol. I & II, S. D. Prasad & Prof. Rakesh
2. Coal Mines Conservation & Development Act Mines & Minerals (Development and Regulation) Act Vocational Training Rules
3. Mine Accidents : B. K. Kejariwal
4. Mines Rescue Rules
5. Indian Electricity Rules
6. Mineral Concession Rules.
7. D.G.M.S. Circulars and Bylaws

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Mining and Mineral Processing, VI-Semester

Departmental Elective MM 603 (B) - 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

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Mining and Mineral Processing, VI-Semester

Open Elective MM 604 (A) - Physical Separation Processes

UNIT 1:
Introduction to physical separation processes: different types of processes employed in mineral engineering, Ore characteristics required for applying these processes.

UNIT 2:
Jigging: Principles of jigging including the three major phenomena, equal settling/jigging particles, v-t curves, jig cycles and their applications, different types of jigs-mechanical and pneumatic jigs their merit and demerits, variables affecting jigging, jig circuits.
Heavy media separation: Principles of heavy media separation, stability of media suspension, preparation of heavy media, regeneration of heavy media solids, typical media circuits, separation characteristics of heavy media separators i.e. dynamic and static separators, beneficiation of metallic and non-metallic minerals using heavy media separators.

UNIT 3:
Flowing film concentration: Principles and practices, tabling, influence of various factors affecting tabling, mathematical analysis, different types of tables. Spiral concentration, application of spiral concentrators, Reichert's cone.
Enhanced gravity concentration: Enhanced gravity concentrators like multigravity separator, floatex density separator, Knelson concentrator, Kelsey jig, Falcon separator etc,.

UNIT 4:
Magnetic Separation: Principles of magnetic separation, different forces involved in dry and wet magnetic separation. Dry, wet, low and high intensity separators, drum separators, induced roll separator, cross belt separator, WHIMS, HGMS, typical flow sheets.

UNIT 5:
Electrostatic Separation: Principles of electrostatic separation lifting and pinning effect, corona discharge, multi roll separator, application electrostatic separators, typical flow sheets.

Reference Books:

1. The Principles of Coal Preparation (G. J. Sanders)
2. Mineral Processing Technology (B. A. Wills)
3. Principles of Mineral Dressing (A. M. Gaudin)
4. Coal Preparation (J. W. Leonard)
5. The Coal Handbook: Towards Cleaner Production (D.J. Osborne)
6. Coal preparation, Vol-1 and Vol-2, D. J.Osborne

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Mining and Mineral Processing, VI-Semester

Open Elective MM 604 (B) - Surface Phenomenon and Froth Flotation

UNIT I

Physics and Chemistry of interfaces: Types of interfaces, surface energy and surface defects, surface tension applications, interfacial tension, cohesion, adhesion. Surface tension as applied to mineral beneficiation, double layer at solid liquid interface, electro-kinetic phenomena. Basics of electrochemical adsorption of particle surface in flotation. Correlation between structure and adsorption for organic reagents in flotation, Chemistry of flotation reagents.

UNIT II

Flotation fundamentals: Fundamental concepts, flotation theory including kinetics, classification and functions of flotation reagents, laboratory flotation tests; types of flotation: carrier flotation, selective flotation, floc-flotation, skin flotation, reverse flotation, electro flotation etc.

UNIT III

Flotation machines: Typical flotation machines Basic machine features and functions, Design features of different flotation machines, selection and sizing of flotation machine based on kinetic data. Modern Flotation machines like Column Flotation, Jameson Cell etc. Flotation circuits – Roughing, Scavenging, cleaning etc.

UNIT IV

Plant practices: Flotation circuits for flotation of coal, copper, lead-zinc sulphide, fluorspar, rock phosphate, limestone, manganese, etc

Text Reference Books:

1. The Principles of Coal Preparation (G. J. Sanders)
2. Mineral Processing Technology (B. A. Wills)
3. Principles of Mineral Dressing (A. M. Gaudin)
4. Coal Preparation (J. W. Leonard)
5. The Coal Handbook: Towards Cleaner Production (D.J. Osborne)
6. Coal preparation, Vol-1 and Vol-2, D. J.Osborne

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Mining and Mineral Processing, VI-Semester

MM 605 Numerical Modeling Practical

Being totally computer based numerical modeling techniques have a special touch of glamour and sophistication compare to other approaches in rock mechanics and ground control techniques. The results of the modern software packages are presented in attractive and convincing fashions.

Numerical modelling using softwares:

1. Design of openings & pillars
2. Design of supports for bord & pillar and longwall workings.
3. Design of pit slopes & dumps and estimating their stability in case of oprncast mines.
4. Analysis of shield support interaction in case of longwalls.
5. Analysis of long term stability of permanent mine excavations.
6. Prediction of surface subsidence over mine excavations.
7. Simulating effects of blasting on stability of mine workings in underground as well as in opencast mines.

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Mining and Mineral Processing, VI-Semester

MM- 606 Fuel Technology

1. Proximate analysis of coal;
2. Free swelling index of coal;
3. Caking index of coal;
4. Determination of total sulphur;
5. Determination of viscosity of oil.