SCHEME OF TEACHING AND EXAMINATION

B.E. MINING ENGINEERING

V SEMESTER

Sl. No.	Sub- Code	Title	Teaching Dept.	Teaching Hours/ Week		Examination			
				Theory	Practical	Duration	I.A. Max. Marks	Theory/ Practical	Total Marks
1	06AL 51	Management & Entrepreneurship	@	04	-	03	25	100	125
2	06MN 52	Mine Environmental Engineering – I	MN	04	-	03	25	100	125
3	06MN 53	Mining Machinery – II	MN	04	-	03	25	100	125
4	06MN 54	Mine Surveying – II	MN	04	-	03	25	100	125
5	06MN 55	Underground Coal Mining	MN	04	-	03	25	100	125
6	06MN 56	Mineral Economics	MN	04	-	03	25	100	125
7	06MNL 57	Mining Machinery Lab	MN	-	03	03	25	50	75
8	06MNL 58	Mine Surveying Lab – II	MN	-	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

@ Teaching department may be any Engineering department /Department of Business Administration

SCHEME OF TEACHING AND EXAMINATION

B.E. MINING ENGINEERING

VI SEMESTER

Sl. No.	Sub- Code	Title	Teaching Dept.	Teaching Hours/ Week		Examination			
				Theory	Practical	Duration	I.A. Max. Marks	Theory/ Practical	Total Marks
1	06MN 61	Surface Mining	MN	04	--	03	25	100	125
2	06MN 62	Mineral Processing	MN	04	--	03	25	100	125
3	06MN 63	Underground Metal Mining	MN	04	--	03	25	100	125
4	06MN 64	Mine Environmental Engg. – II	MN	04	--	03	25	100	125
5	06MN 65	Rock Mechanics	MN	04	--	03	25	100	125
6	06MN 66x	**Elective-1 (Group A)**	MN/ME	04	--	03	25	100	125
7	06MNL 67	Mineral Processing Lab	MN	-	03	03	25	50	75
8	06MNL 68	Mine Environmental Engg. Lab	MN	-	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

Elective - I (Group A)

06MN661	Fuel Technology and Coal Preparation
06MN662	Engineering Economics
06MN663	Small Scale & Marine Mining

SCHEME OF TEACHING AND EXAMINATION

B.E. MINING ENGINEERING

VII SEMESTER

Sl. No.	Sub- Code	Title	Teaching Dept.	Teaching hours/ Week		Examination			
				Theory	Practical	Duration	I.A. Max. Marks	Theory/ Practical	Total Marks
1	06MN 71	Mine Planning and Design	MN	04	-	03	25	100	125
2	06MN 72	Ground Control	MN	04	-	03	25	100	125
3	06MN 73	Computer Applications in Mining	MN	04	-	03	25	100	125
4	06MN 74	Operation Research	MN/ME	04	-	03	25	100	125
5	06MN 75x	**Elective-II (Group B)**	MN	04	-	03	25	100	125
6	06MN 76x	**Elective-III (Group C)**	MN	04	-	03	25	100	125
7	06MNL 77	Rock Mechanics Lab	MN	-	03	04	25	50	75
8	06MNL 78	Computer Application in Mining Lab	MN/ME	-	03	03	25	50	75
TOTAL				**24**	**06**	**25**	**200**	**700**	**900**

Elective-II (Group B)		**Elective-III (Group C)**	
06MN751	Advanced Surface Mining	06MN761	Mine Legislation
06MN752	Project Management	06MN762	Operations Management
06MN753	Software Engineering	06MN763	Maintenance Management in Mines

SCHEME OF TEACHING AND EXAMINATION

B.E. MINING ENGINEERING

VIII SEMESTER

Sl. No.	Sub- Code	Title	Teaching Dept.	Teaching hours/ Week		Examination			
				Theory	Practical	Duration	I.A. Max. Marks	Theory/ Practical	Total Marks
1	06MN81	General Safety	MN	04	-	03	25	100	125
2	06MN82	Mine Management	MN	04	-	03	25	100	125
3	06MN83x	**Elective-IV (Group D)**	MN	04	-	03	25	100	125
4	06MN84x	**Elective-V (Group E)**	MN	04	-	03	25	100	125
5	06MN85	Project Work	MN	-	06	03	100	100	200
6	06MN86	Seminar on Project Work	MN	-	03	-	50	-	50
TOTAL				**16**	**09**	**15**	**250**	**500**	**750**

Elective-IV (Group D)		**Elective-V (Group E)**	
06MN831	Mine Transport System	06MN841	Deep Mining
06MN832	Mining Geo Statistics	06MN842	Mine Environment & Ecology
06MN833	Total Quality Management	06MN843	Rock Excavation Engineering

MANAGEMENT & ENTREPRENEURSHIP

Subject Code	:	**06AL51**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

MANAGEMENT

UNIT - 1

MANAGEMENT: Introduction - Meaning - nature and characteristics of Management, Scope and functional areas of Management - Management as a Science, Art or Profession Management & Administration - Roles of Management, Levels of Management, Development of Management Thought-Early Management Approaches-Modern Management Approaches.

7 Hours

UNIT - 2

PLANNING: Nature, importance and purpose of planning process - Objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans.

6 Hours

UNIT - 3

ORGANISING AND STAFFING: Nature and purpose of organization - Principles of organization - Types of organization - Departmentation - Committees – Centralisation Vs Decentralisation of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of Staffing - Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing - Leadership styles, Motivation Theories, Communication - Meaning and importance – Coordination, meaning and importance and Techniques of Co - ordination. Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control.

7 Hours

PART - B

ENTREPRENEURSHIP

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur - an emerging Class. Concept of Entrepreneurship - Evolution of

Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

6 Hours

UNIT - 6

SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start an SSI - Government policy towards SSI; Different Policies of S.S.I.; Government Support for S.S.I. during 5 year plans, Impact of Liberalization, Privatisation, Globalization on S.5.1., Effect of WTO/GATT Supporting Agencies of Government for S.5.!., Meaning; Nature of Support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition only)

7 Hours

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency: SISI; NSIC; SIDBI; KSFC.

6 Hours

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities - Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

7 Hours

TEXT BOOKS:

1. **Principles of Management** - P. C. Tripathi, P. N. Reddy; Tata McGraw Hill.
2. **Dynamics of Entrepreneurial Development & Management** - Vasant Desai Himalaya Publishing House.
3. **Entrepreneurship Development** - Small Business Enterprises - Poornima M Charantimath - Pearson Education - 2006

REFERENCE BOOKS:

1. **Management Fundamentals** - Concepts, Application, Skill Development Robert Lusier – Thomson.
2. **Entrepreneurship Development** - S S Khanka - S Chand & Co.
3. **Management** - Stephen Robbins - Pearson Education /PHI -17th Edition, 2003

MINE ENVIRONMENTAL ENGINEERING – I

Subject Code	:	**06MN52**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

MINE AIR: Atmospheric air and composition of mine air, Mine Gases:- Occurrence, properties, detection, measurements and physiological effects.

6 Hours

UNIT - 2

STUDY ON FIRE DAMPS: Methane content, emission of methane, degree of gassiness of a coal mine, gas blowers, gas outbursts, dealing of firedamp in mines. Methane streaming and layering, methane drainage, testing of firedamp. Problems on mine gases.

7 Hours

UNIT - 3

MINE CLIMATE: Physiological effects of mine climate, objective of mine ventilation, air quantity requirement, pressure, barometric pressure, temperature, sources of heat in mines, moisture content of mine air, effects of heat and humidity on the miner, cooling power of mine air, psychometry and air conditioning. Problems.

6 Hours

UNIT - 4

AIR FLOW THROUGH MINE OPENINGS: Fundamentals of air flow, Reynolds number, laminar and turbulent flow, pressure losses due to friction and shock resistance, resistance of airways:- laws of mine air friction, co-efficient of friction, resistance of roadways in series and parallel, resistance of leaky airways, characteristic of an airway (or) mine, equivalent orifice, Economic design of an airway. Distribution of air and flow control devices. Problems.

7 Hours

PART - B

UNIT - 5

NATURAL VENTILATION: Mechanism, causes, calculation of Natural Ventilation Pressure from air densities, other methods of determining Natural Ventilation Pressure, motive column. Problems on Natural Ventilation Pressure.

6 Hours

UNIT - 6

MECHANICAL VENTILATION: Types of fans, theory, efficiencies, characteristic curves and suitability of fans, selection, testing and output control of a mine fan. Fans in series and parallel, forcing and exhaust ventilation, reversal of air currents, diffusers, evasees, ventury, booster and auxiliary fans. Problems.

8 Hours

UNIT - 7

VENTILATION SURVEY: Importance of ventilation survey, types: - qualitative surveying, pressure survey and quantity survey. Simple problems.

6 Hours

UNIT - 8

ELEMENTS OF VENTILATION PLANNING: Objective, steps in ventilation planning, desirable features of a ventilation system, types of ventilation system, quantity requirement, analysis of ventilation cost.

6 Hours

TEXT BOOKS:

1. **Elements of Mining Technology -** Vol II- D. J. Deshmukh, 9th Edition, Central Techno Publication, Nagpur, 1998.
2. **Mine Environment and Ventilation** – G. B. Mishra, Oxford University Press, 1994.

REFERENCE BOOKS:

1. **Mine ventilation and air conditioning** – Howard L. Hartman. Wiley International, 1976.
2. **Environmental Engineering in Mines** – Vutukuri & Lama, Cambridge University Press, Cambridge, 1992.
3. **Legislation in Indian mines a critical appraisal** Vol. I and Vol. II – Prasad and Rakesh. Vivek Publications, Varanasi 1999.
4. **Mine Ventilation** Vol. – II, S. Ghatak, Coalfield Publishers, 1993.
5. **Numerical Problems on Mine Ventilation**, L. C. Kaku, Lovely Prakashan, Dhanbad.
6. **Basics of Mine Ventilation**, P. C. Shyam, Lovely Prakashan, Dhanbad.

MINING MACHINERY-II

Subject Code	:	**06MN53**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

DRAINAGE AND PUMPING: Methods to prevent inflow of water into mine workings, mine pumps, different types of pumps-centrifugal, turbine, roto pump, mono block pump, drill operated pump, displacement pumps.

7 Hours

UNIT - 2

PERFORMANCE AND CHARACTERISTIC OF PUMPS: Performance and characteristic of centrifugal and turbine pumps. Pumps in shafts and roadways and their maintenance. Sumps: location and capacity. Layout of main underground pumping stations.

7 Hours

UNIT - 3

FACE MECHANIZATION: Classification-continuous and intermittent road headers, Shearer, their application, limitation and specification.

6 Hours

UNIT - 4

ALLIED FACE MACHINERIES: Coal Ploughs, coal cutting machines, their application, limitation and specification.

6 Hours

PART - B

UNIT - 5

ALLIED MACHINERY: Basic Principles of drilling, cutting and ploughing machines. Different types of hydraulic props, chocks, chock shields, canopies, armoured face conveyors and stage loaders.

7 Hours

UNIT - 6

DEVELOPMENT OF FACE MECHANIZATION: Recent developments in face mechanization. L.H.D., S.D.L., L.P.D.T. and Rocker Shovel**.**

6 Hours

UNIT - 7

TRACKLESS EQUIPMENTS: Application and limitation.

6 Hours

UNIT - 8

MACHINERY MAINTENANCE: Maintenance management and safety, CAD, Remote monitoring and controlling in mines and automation. Application of Computer for Maintenance.

7 Hours

TEXT BOOKS:

1. **Elements of Mining Technology** - Vol. III – D. J. Deshmukh, 6th edition Central Techno Publication, Nagpur, 1998.
2. **Modern Coal Mining Technology** – S. K. Das, 2nd edition, Lovely Prakashan.

REFERENCE BOOKS:

1. **Coal Mining** – I.C.F. Statham Vol. I and Vol. III The Caxton Publishing Company Ltd. Inc. 1958.
2. **Longwall Mining** – Syd. S. Peng and H. S. Chang, John Wiley and Sons Inc. 1983.
3. **Selection, Installation and maintenance of mine pumps**. – Rakesh and M. G. Lele. 2nd edition, Nishkam Press Meerut 1975.
4. **Mine Pumps, Haulages and Winding**, S. Ghatak, Coal Field Publisher, Asansol, 1995.
5. **Mine Hoisting**, M. A. Ramulu, Oxford and IBH 1996.

MINE SURVEYING – II

Subject Code	:	**06MN54**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

TACHOMETRIC SURVEY: Application and limitation, principles and methods, annalactic lense, reduction of stadia notes, errors.

7 Hours

UNIT - 2

TRIANGULATION SURVEY: Principles, classification, steps in triangulation survey, base line measurements and corrections, base networks, Problems.

7 Hours

UNIT - 3

CURVE RANGING: Linear and angular methods of setting out of simple curves, requirements and functions of a transition curve.

6 Hours

UNIT - 4

OPEN CAST SURVEY: Principles, methods and survey network, Calculation of areas and volumes, mid ordinate and average ordinate, trapezoidal method, Simpson method, contour method.

6 Hours

PART - B

UNIT - 5

CORRELATION SURVEY: Principles, Classification, Methods, Shaft Plumbing, Assumed Bearing, Weisback Triangle, Coplanning, Weisback quadrilateral, Problems on correlation survey etc. and degree of accuracy.

8 Hours

UNIT - 6

STOPE SURVEYING: Definition, purpose, methods: Tape triangulation, Ray, steeply dipping ore bodies, moderately dipping ore bodies, degree of accuracy.

6 Hours

UNIT - 7

SUBSIDENCE SURVEY: Principles, method and degree of accuracy, underground traversing, setting out gradients in tunnels and adits, Mine plans and sections, duties and responsibilities of surveyors care and precaution in storage statutory responsibilities.

6 Hours

UNIT - 8

THEORY OF ERRORS: Introduction to errors and its theory, propagation of errors, their prevention and elimination, methods of least square and its application probable errors of single observation and most probable value, weight and weighted observations and their probable errors.

6 Hours

TEXT BOOKS:

1. **Surveying** - Vol. II – B. C. Punmia, 12th edition, Lakshmi Publiscations, 1994.
2. **Metalliferous Mine Surveying** - Fedrick Wini Berg, 2nd edition Mining Publications, London, 1935.

REFERENCE BOOKS:

1. **Mine Surveying** - Vol. I, II, III, Ghatak, 5th edition, Coal Field Publishers, 1996.
2. **Mine Surveying -** by V. Borsheh – Komponiets, Mir-Publishers, 1989.
3. **A Text Book of Advanced Surveying** - Jawahar Lal Sharma, C.B.S. Publishers and Distributors, 1985.

UNDERGROUND COAL MINING

Subject Code	:	**06MN55**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Coal mining in major coal producing countries, Growth of coal mining industry in India, Grading and analysis of coal, Opening of Coal Seams: Access by adits, Opening up of coal seams by surface drifts on incline, vertical shafts, Division of mine into blocks.

7 Hours

UNIT - 2

CHOICE OF COAL MINING METHODS: Basic Mining Methods, Board and Pillar, Longwall and Shortwall, Factors influencing choice of mining methods.

6 Hours

UNIT - 3

BOARD AND PILLAR MINING: Board and Pillar Mining System. Design of Board and Pillar workings, Mining Processes, Development of Panels, Extraction of Pillars and Examples of Pillar extraction techniques.

7 Hours

UNIT - 4

ROOM AND PILLAR MINING: Applicability, Merits and Demerits. Variants of Room and Pillar Mining Method. Simple Problems.

6 Hours

PART - B

UNI - 5

LONGWALL MINING: Elements of a Longwall face, Classification of Modern Longwall faces, Planning of Longwall Mining System, Development of Panel and faces, face support system, Power supply, material supply and face organization. Strata mechanics around Longwall panel.

7 Hours

UNIT - 6

THIN SEAM MINING BY LONGWALL METHOD: Method of working thin, medium thick and thick seams by Longwall Mining with case studies of Indian and foreign Mines. Simple Problems.

6 Hours

UNIT - 7

THICK SEAM MINING: Problems of Mining Thick Coal Seams, Choice of Method of Mining Thick Coal Seams, Inclined Slicing, Horizontal Slicing, Diagonal Slicing, Transversely Inclined Slicing, Sublevel Caving, Working Steep and Moderately Thick Seams, The Velenjee Method, Descending Shield Method of Mining.

6 Hours

UNIT - 8

SPECIAL METHODS OF MINING: Inseam Mining and Horizon Mining, Hydraulic Mining, Blasting Gallery Method, Coal Bed Methane. Goaf Control: Caving, strip packing or solid stowing, Hydraulic Stowing etc. Procurement of stowing materials and its transportation, theoretical aspects and case studies.

7 Hours

TEXT BOOKS:

1. **Principles and Practices of Modern Coal Mining** – R. D. Singh, New Age International, 1997.
2. **Modern Coal Mining Technology** – S. K. Das, 2nd edition, Lovely Prakashan Publishers, 1994,

REFERENCE BOOKS:

1. **Underground Coal Mining Methods** – J. G. Singh, Braj Kalpa Publishers, Varnasi, 2000.
2. **Coal Mining** – I.C.F. Statham, Vol. I, II, III and Vol. III. The Caxton Publishing Company Ltd. Inc. 1958.
3. **Longwall Mining** – S. Peng & H. S. Chang, John Wiley and Sons Inc. 1983.
4. **Winning & Working of Coal** - Vol. I, II – D. J. Deshmukh, Asia Publsihing House, Bombay, 1967.
5. **Universal Mining School Volumes**. Cardiff [GT. Britain], 1931.
6. **SME Mining Engg. Hand Book** – Hartman, 2nd edition S.M.M. & Exploration Inc. 1992.
7. **Underground Winning of Coal** – T. N. Singh, Oxford and IBH. 1992.
8. **Advanced Coal Mining**, Vol. 1 and 2 – Vorbojev & Deshmukh, Asia Publishing House, Bombay, 1964.
9. **Thick Seam Mining** – T. N. Singh and B. B. Dhar, Oxford and IBH, 1992.

MINERAL ECONOMICS

Subject Code	:	**06MN56**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Role of mineral industry in national economy, special features of mineral industry, essential and strategic minerals of India and their economic significance.

7 Hours

UNIT - 2

NATIONAL MINERAL POLICY: Appraisal of Mineral Resources, Pricing policy, Exports and Imports, taxation and subsidies, conservation of Minerals.

7 Hours

UNIT - 3

SAMPLING: Definition, purpose, scope, common methods of sampling, types of samples, errors in sampling.

6 Hours

UNIT - 4

ESTIMATION OF RESERVES: Classification of reserves, tenor, grade. Preparation of assay plans, longitudinal cross sections and calculation of ore reserves.

6 Hours

PART - B

UNIT - 5

MINE VALUATION 1: Factors affecting mine valuation, life of mine, redemption of capital, project assessment by D.C.F., net present value methods, Hoskold's two rate formula, effects of inflation.

6 Hours

UNIT - 6

MINE VALUATION 2: Mining fixed costs, operating costs, cut-off grade, feasibility study, project planning, project evaluation, depreciation, problems on mine valuation and depreciation.

7 Hours

UNIT - 7

FINANCIAL MANAGEMENT: Methods of financing industrial enterprises, structure, formation and capitalization. Sources of finance, shares, and debentures. Principles of book keeping as applied to mining industry and accountancy. Balance sheet, profit and loss accounts, wage systems and incentives.

7 Hours

UNIT - 8

COST ACCOUNTING: Introduction, need for cost accounting, elements of cost, overheads, allocation of over heads, breakeven analysis.

Budget and Budgetary control: Definition of budget, Principle of budget and budgetary control, types of budgets.

6 Hours

TEXT BOOKS:

1. **Mineral and Mine Economics** by R. T. Deshmukh, Myra Publications, Nagpur, 1986.
2. **Mineral Economics** by N. L. Sharma and Sinha, Oxford and IBH, 1992.

REFERENCE BOOKS:

1. **Mineral Economics** by Truscot, John Wiley and Sons, Inc, 1987.
2. **Mining Geology** by Arogyaswamy. R.N.P. 4th edition, Oxford and IBH, 1992.
3. **Prospecting for Atomic Minerals** by Knoerr, A. W. and Lutgetn. GP. Oxford and IBH, 1992.
4. **Industrial Management** O. P. Khanna, Dhanpat Rai and Sons, 1999.

MINING MACHINERY LABORATORY

Subject Code	:	**06MNL57**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

EXPERIMENTS

PART - A

1. To study constructional details and functioning of Jack Hammer.
2. To study constructional details of different wire ropes.
3. Sketch and write details of safety hook and its function.
4. Write details of capping and recapping procedures.
5. Write details of suspension gear with sketch

PART - B

6. To study construction and working of a turbine pump.
7. To study Lilly controller and automatic contrivances in a winder.
8. To study skip loading and unloading arrangement and skip design.
9. Write details of good track laying and also details of diamond crossing.
10. To study the constructional details of lubricator and air leg.

MINE SURVEYING LABORATORY-II

Subject Code	:	**06MNL58**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

EXPERIMENTS

PART - A

1. Demonstration of precise level, digital planimeter EDM and total station.
2. Determine the constant K and C of the tachometer.
3. Determine the distance and elevation by
   a) Stadia Method
   b) Tangential Method
4. Determine the gradient between Two points by Tachometric Survey
5. Simple curve ranging by linear and angular method.
   a) Deflection distance Method.
   b) Rankines Method.

PART - B

6. Correlation Survey:
   a) Correlation survey by Direct Traversing through Incline
   b) Correlation survey by Direct Traversing through Incline and Shaft.
   c) Correlation survey by Weisback Coplanning Method.
   d) Correlation survey by Weisback Triangle Method.
7. Underground Traversing.
8. Transfer of levels from surface to underground.
9. To control the directions of underground workings.
10. To determine the center of the shaft.
11. To establish the missing point between two known points by assumed bearing method.
12. To conduct correlation survey by assumed bearing method.

VI SEMESTER

SURFACE MINING

Subject Code	:	**06MN61**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: General consideration for the applicability of opencast mining, limits of open cast mining and its advantages and disadvantages. Method of opening box cut, selection of site for box cut.

6 Hours

UNIT - 2

OPEN PIT LAYOUT AND DESIGN: Planning the layout and open pit mine with special reference to large mechanized mines. Optimum dimensions of open pit mines. Removal of over burden and disposal, open cast bench-number, height, width and slope angle of the bench. Factors affecting the stability of the slope. Various types of slope failures, problems on slope failures. Ground water control.

8 Hours

UNIT - 3

DRILLING AND BLASTING: Drillability, mechanics of drilling, major types of drilling machines, basics of mechanics of blasting, principles of fragmentation.

6 Hours

UNIT - 4

DESIGN OF BLASTING: With special reference to heavy blasting, air blasting, ground vibration, fly rocks novel methods of drilling, smooth blasting and pre-splitting.

6 Hours

PART - B

UNIT - 5

SURFACE MINING METHODS: Casting, strip, quarrying and Placer Mining.

6 Hours

UNIT - 6

EXCAVATION AND LOADING: Shovels, Dragline, Front-end loader, Stackers, Graders.

6 Hours

UNIT - 7

NON-CYCLIC SURFACE MINING: Bucket Wheel Excavators and Continuous surface miners.

6 Hours

UNIT - 8

TRANSPORT EQUIPMENTS: Dumpers, Aerial ropeways-monocable and bicale btypes and their constructional details. Shovel – dumper combination, high angle conveyor and in-pit crusher. Selection of equipments.

8 Hours

TEXT BOOKS:

1. **Surface Mining Technology** by S. K. Das, Lovely Prakashan, Dhanbad, 1994.
2. **Surface Mining** by G. B. Mishra, Dhanbad Publishers, 1978.

REFERENCE BOOKS:

1. **Elements of Mining Technology**, Vol. – I, D. J. Deshmukh, 6th Edition, Central Techno Publications, Nagpur, 1998.
2. **Opencast Mining** – R. T. Deshmukh, M. Publications, Nagpur, 1996.
3. **Latest Development of Heavy Earth Moving Machinery** Amithosh De, Annapurna Publishers, Dhanbad, 1995.
4. **Rock Slope Engineering**, Hock and Bray, The Institution of Mining and Metallurgy, 1981.
5. **Introductory Mining Engineering**, Hartman, John Wiley and Sons, 1987.
6. **Surface Mining**: The American Institute of Mining Metallurgical and Petroleum Engineers In. 1968.

MINERAL PROCESSING

Subject Code	:	**06MN62**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Definition, objectives, scope. Pretreatment and Sorting of Ores, objective of pre treatment, different types of pre treatment. Sorting process, different methods of sorting such as manual, mechanical sorting, Numericals on pre treatment.

6 Hours

UNIT - 2

METALLURGICAL ACCOUNTING: Sampling, Definition, objectives, different types of sampling methods. Hand sampling, mechanical and electrical sampling. Mass balancing methods. Numericals on sampling and mass balancing methods.

7 Hours

UNIT - 3

COMMUNITION AND LIBERATION: Defintion, objectives of communition, principles of communition, theories of communition, stages of communition, Liberation and its concepts.

6 Hours

UNIT - 4

CRUSHING: Principles of crushing, primary crushing and secondary crushing, construction and operation of various crushing machines such as primary and secondary crushers. **Grinding**: Theory of grinding, critical speed, types of grinding mills, such as ball mills, rod mill, autogenous mills, close circuit and open circuit grinding.

7 Hours

PART - B

UNIT - 5

LABORATORY SIZING AND INDUSTRIAL SCREENING: Definition, Importance of sizing, laboratory sizing and interpretation of data, screening and factors affecting the screening Industrial screening and types of Industrial screens. Movement of solids in fluids, Laws of settling of solids in fluids, Stokes Law, Newtonial law, equal settling particles, classification of different types of classifiers, free settling, Hindered settling, laminar flow and turbulent flow.

7 Hours

UNIT - 6

CONCENTRATION PROCESS: Principles of gravity concentration: Jigging, Flowing film concentration and equipments. Principles of magnetic and high tension Separation, different types of magnetic separators, their construction and operation.

7 Hours

UNIT - 7

FLOTATION: Physio-chemical Principles of flotation. Flotation reagents and machines.

6 Hours

UNIT - 8

DEWATERING: Principles and techniques: thickening, filtration, and drying techniques. **Plant Practice:** Study of flow sheets for typical ores of copper, lead, iron, chromite, uranium.

6 Hours

TEXT BOOKS:

1. **Mineral Processing Technology**, B. A. Wills, 5th Edition, Pergamon Press.
2. **Ore Processing**, S. K. Jain, @nd Edition, Oxford IBH, 1990.

REFERENCE BOOKS:

1. Hand Book of **Mineral Processing taggart**, John willy & Sons, 1945.
2. **Introduction to mineral Processing** Errol G. Kelly and David J. Spottiswood, John Wiley and Sons, 1982.
3. **Principles of Mineral Dressing**, A. K. Gaudin, TMH Edition, Tata Mc. Graw Hill, 1971.

UNDERGROUND METAL MINING

Subject Code	:	**06MN63**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO METAL MINING: Peculiarities of Metaliferous deposits, scope and limitations of u/g metal mining.

5 Hours

UNIT - 2

MINE DEVELOPMENTS: Methods of developments, factors affecting the choice of level interval, Block size, shaft station, ore bin and ore pass. Shape and size of drive, cross cut, raise, winze and their position in relation ore body.

8 Hours

UNIT - 3

STOPING: Classification of stoping methods, factors affecting choice of stoping methods like depth, dip, width, grade of the ore, physio mechanical characteristics of ore and wall rocks.

6 Hours

UNIT - 4

STOPING METHODS: Open stoping, Overhand, Underhand, Breast stoping. Stoping with supports; Shrinkage stoping, Cut and fill method of stoping, square set stoping. Caving methods: Top slicing, sub level caving and block caving.

7 Hours

PART - B

UNIT - 5

TRENDS OF NEW METHODS: Sub level stoping, long hole stoping, blast hole stoping, V.C.R. stoping, in-situ leaching, biomineral engineering, hydraulic mining.

7 Hours

UNIT - 6

SPECIAL METHODS: Extraction of remnant pillars, Shaft pillars and contiguous reefs, their supporting system and special precaution during extraction.

7 Hours

UNIT - 7

DEEP MINING: Introduction to deep mining problems and stoping method in deep mining,

6 Hours

UNIT - 8

APPLICATIONS: Tunnel and Shaft boring machines and their applications.

6 Hours

TEXT BOOKS:

1. **Introductory Mining Engineering** - Hartman. John Wiley and Sons Inc.1987.
2. **Elements of Mining Engineering** - D. J. Deshmukh, Central techno publishers.

REFERENCE BOOKS:

1. **Deep Mining** - Jack Spalding, Mining publication Ltd.Inc.1949.
2. **SME Mining Engineering Hand Book** - Hartman, Society for Mining, Metallurgy and exploration.Inc.1992.
3. **U/G Mining Method** - Hustrulid, Society for Mining, Metallurgy & Exploration.Inc.1982.

MINE ENVIRONMENTAL ENGINEERING – II

Subject Code	:	**06MN64**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

MINE FIRES: Classification, surface and underground fires, prevention and control of underground fires, fire fighting, study of atmosphere behind sealed off area, re-opening of sealed off area.

7 Hours

UNIT - 2

SPONTANEOUS HEATING: Mechanism, factors governing spontaneous heating, stages of spontaneous heating, symptoms of spontaneous heating in underground mines, detection and prevention of spontaneous heating, interpretation of mine air samples, Graham's Index, Problems on Graham's Index.

6 Hours

UNIT - 3

EXPLOSIVES: Types, mechanism, ignition temperature, lag on ignition, causes and coal dust and fire damp explosions. Stone dusting, stone dust barriers and water barriers, investigation after the explosion.

7 Hours

UNIT - 4

INUNDATION: Causes, measures against inundations. Dams: types, design, construction of water dams. Dewatering water logged workings, precautions to be taken when approaching old water logged workings, safety boring apparatus.

6 Hours

PART - B

UNIT - 5

MINE ILLUMINATION: Technical terms in lighting and photometry, Underground lighting, Electric safety lamp, different types of portable lamps, Methods of illumination in underground mines- fixed system, mobile system.

7 Hours

UNIT - 6

MINE LIGHTING IN OPENCAST MINES: Lighting in opencast mines, standards for mine lighting, Illumination survey, Luminance calculations, and luminance calculations.

7 Hours

UNIT - 7

MINE RESCUE: Mine Rescue and equipment, short distance apparatus, self contained breathing apparatus, self rescuers, organization of rescue.

6 Hours

UNIT - 8

MINE RECOVERY: Recovery work in connection with fires, explosions and inundations.

6 Hours

TEXT BOOKS:

1. **Mine Disasters and Mine Rescue**, M. A. Ramulu, Oxford & IBH Publishing Co. Ltd., 1991.
2. **Elements of Mine Technology** Vol. II by D. J. Deshmukh, 6th Edition, Central Techno Publications, Nagpur.

REFERENCE BOOKS:

1. **Fires in Coal Mines -** L. C. Kaku, 2nd Edition Oriental Publishers, 1985.
2. **Mine Ventilation -** S. Ghatak, Vol. I, Coal Field Publishers, Asansol, 1983.
3. **Underground Mine Lighting** – Torter, Vol. II, Trans Tech Publication, Frg, 1982.
4. **Environmental Engineering in Mines** - V. S. Vutukuri & R. D. Lama, Cambridge University Press, 1992.

ROCK MECHANICS

Subject Code	:	**06MN65**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO ROCK MECHANICS: Definition, Scope and importance, development, application in mining, Discontinuities; Description of discontinuities, Introduction to mapping and hemispherical projection of discontinuities, Barton's shear strength of joints.

7 Hours

UNIT - 2

ANALYSIS OF STRESS: Introduction, Definition and basic concepts, stress in a plane, (two dimensional stress), Mohr's Circle of stress, Secondary principal stress, equations of equilibrium, plane stress equations.

6 Hours

UNIT - 3

ANALYSIS OF STRAIN: Introduction, Definition and basic concepts, strain in a plane, (two dimensional stress), Mohr's Circle of strain, equations of compatibility, stess-strain relationship, basic equations in elastic theory, plain strain equations, elasto plastic behaviour of rocks. Stress – strain curves of various rocks.

7 Hours

UNIT - 4

PHYSICAL PROPERTIES: Definition and determination of Density, hardness, porosity, permeability, moisture content, degree of saturation. Electrical and thermal properties of rocks.

6 Hours

PART - B

UNIT - 5

MECHANICAL PROPERTIES: Definition and determination of Compressive Strength, tensile strength, shear strength, triaxial testing. Time dependent properties. Scaling of laboratory data to in-situ values. Rock Indices: protodyakanov strength index, point load strength index, RQD.

7 Hours

UNIT - 6

IN-SITU STRENGTH PROPERTIES OF ROCKS: Necessity and requirement, methods of in-situ stress measurements. Plate load test, cable jack test, bore hole test, dilatometer test, flatjack test, hydraulic fracture and velocity propagation.

7 Hours

UNIT - 7

RHEOLOGICAL MODELS: Relationship and rate of change of stress-strain for idealizing materials – Models representing elastic, plastic, viscous, elasto plastic, non-elastic and brittle rock properties.

6 Hours

UNIT - 8

STATIC AND DYNAMIC ELASTIC CONSTANTS OF ROCKS: Static: Introduction, definition, instrument, measurement of deformation: mechanical, optical, electrical gauges, LVDT, calculation of elastic constants of rocks. Dynamic: Introduction, elastic wave, calculation of modulus of elasticity.

6 Hours

TEXT BOOKS:

1. **Strata Mechanics in Coal Mining** - Jeremic, K. L. Jeremic, Rotterdam, Balkema, 1985.

2. **Fundamentals of Rock Mechanics** - Jager & Cook, Methuen andco. London, 1969.

REFERENCE BOOKS:

1. **Continuum Theory of rock Mechanics** - Csaba Asszonyi, Transtech Publications, 1979.
2. **Hand Book on Mechanical Properties of rocks** - R.D. Lama, V. S. Vutukuri, Vol. I to IV, Transtech Publications, 1978.
3. **Mechanics and Engineering** - Charles Jaeger, Cambridge University Press, 1979.
4. **Rock Mechanics for Underground Mining** - 2nd edition, Brady and Brown, Kluwer Academic Publlishers, 1993.
5. **Ground Mechanics in Hard rock Mining** - M. L. Jeremic, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.
6. **Rock Mechanics and Design of Structures in Rock** - L. Obert & W.I. Duvall, John wiley and Sons, 1966.
7. **Rock Mechanics for Engineers** - B. P. Verma, 2nd edition, Khanna Publishers, 1989.
8. **Introduction to Rock Mechanics** - R. E. Goodman, 2nd edition, John wiley and Sons, 1989.
9. **The elements of Mechanics of Mining Ground** - B. S. Verma Vol. I. Julin & Co. Lucknow 1981.
10. **Engineering Rock Mechanics, An Introduction to the Principles** - John A. Hudson and John. P. Harrison Pergamon Press 1997.

ELECTIVE-1 (GROUP-A)

FUEL TECHNOLOGY AND COAL PREPARATION

Subject Code	:	**06MN661**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

SOURCES OF ENERGY: Introduction to sources of energy: fuels, solar energy, nuclear power, wind power, tidal power, geo thermal energy. Classification of fuels: Solid, Liquid and Gaseous fuels. Introduction to liquefaction and gasification of solid fuels.

6 Hours

UNIT - 2

SOLID FUELS: Classification of coal by rank and grade, properties of coals such as ultimate analysis, proximate analysis, Calorific Value, Physical, Mechanical and Thermal Properties. Properties of Coking and Non coking coal.

7 Hours

UNIT - 3

COMBUSTION OF COAL: Mechanism of coal combustion, combustion systems, carbonization of coal: Low temperature carbonization, high temperature carbonization, Physico chemical aspects, coal tar processing.

7 Hours

UNIT - 4

Liquid and Gaseous Fuels: Composition of petroleum, Classification of petroleum, Petroleum Processing, Properties and testing petroleum and petroleum products. Gaseous Fuels: Types of gaseous fuels, Natural gas, Methane from coal mines, producer gas, water gas, coal gas, blast furnace gas, liquefied petroleum gas, Oil gasification, cleaning and purification of gaseous fuels.

6 Hours

PART - B

UNIT - 5

COAL PREPARATION: Introduction, Need for coal preparation, Scope for coal beneficiation in India. Objectives of coal beneficiation, coal beneficiation methods, Essential operation in coal beneficiation plants.

7 Hours

UNIT - 6

FLOAT & SINK TEST: Float and sink test, procedure for float and sink test, construction of washability curves.

6 Hours

UNIT - 7

CONSTRUCTION OF TRAMP CURVE: Interpretation of tramp curve, near gravity material, Yield reduction factor, washability index, optimum degree of washability, washability number.

6 Hours

UNIT - 8

COAL WASHING EQUIPMENTS AND PROCESS: Introduction to the coal beneficiation processes and equipments. **Study of Flow Charts:** Working Principles of major coal washing systems and study of flow sheets

7 Hours

TEXT BOOKS:

1. **Fuels and Combustion** - Dr. Samir Sarkar, Published by Orient Longman Ltd., 1990.
2. **Coal Its Beneficiation** - D.V. Subba Rao, M.K. Publications, 2003.

REFERENCE BOOKS:

1. **Coal Conversion Technology** - Edited by C. Y. Wen, Addison Wesley Publishing Company, 1979.
2. **Coal Carbonisation -** T. K. Basu et al., Allied Publishers, 1996.
3. **The Chemistry and Technology of coal** - James G. Speight, Mercel Dekker, Inc. 1994.
4. **Text Book of Metallurgical Analysis** - B. G. Agarwal and S. P. Jain, Khanna Publications, New Delhi, 1984.
5. **Coal Preparation Practice** - G. G. Sarkar, Oxford and IBH Publishing Co. 1986.
6. **Coal Mining Practice** - I.C.F. Statham Vol. IV, the Caxton Publishing company Ltd. Inc. 1958.

ENGINEERING ECONOMICS

Subject Code	:	**06MN662**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Engineering Decision-Makers, Engineering and Economics, Problem solving and Decision-making, Intuition and Analysis, Tactics and Strategy. Engineering Economic Decision Maze. Law of demand and supply. Law of returns.

7 Hours

UNIT - 2

INTEREST AND INTEREST FACTORS: Interest rate, Simple interest, Compound Interest, Cash-flow diagrams, Exercises and Discussion.

6 Hours

UNIT - 3

PRESENT WORTH COMPARISONS: Conditions for present worth comparisons. Basic present worth comparisons, present worth equivalence, net present worth, Assets with unequal lives, infinite lives. Future worth comparison, pay-back comparison, Exercises, Discussions and problems.

6 Hours

UNIT - 4

EQUIVALENT ANNUAL WORTH COMPARISONS: Equivalent Annual Worth Comparison methods, Situations for equivalent Annual Worth Comparisons, Consideration of asset life, Comparison of assets with equal and unequal lives, Use of shrinking fund method, Annuity contract for guaranteed income, Exercises, Problems.

Rate of Return Calculations: Rate of Return, Minimum acceptable rate of return, IRR, IRR misconceptions, Cost of capital concepts.

7 Hours

PART - B

UNIT - 5

BRIEF DISCUSSION ON DEPRECIATION AND TAX CONSIDERATIONS: Causes of Depreciation, Basic methods of computing depreciation charges, Tax concepts, Corporate income tax. **Estimating and Costing:** components of costs such as Direct Material Costs, Direct Labor Costs, Fixed Over-Heads, Factory cost, Administrative Over-Heads, First cost, Marginal Cost, Selling price, Estimation for simple components.

8 Hours

UNIT - 6

INTRODUCTION, SCOPE OF FINANCE, FINANCE FUNCTIONS: Statements of Financial Information: Introduction, Source of financial information, Financial statements, Balance sheet, Profit and Loss account, relation between Balance sheet and Profit and Loss account.

6 Hours

UNIT - 7

FINANCIAL RATIO ANALYSIS: Introduction, Nature of ratio analysis, Liquidity ratios, Leverage ratios, Activity ratios, Profitability ratios, Evaluation of a firm's earning power. Comparative statements analysis.

6 Hours

UNIT - 8

FINANCIAL AND PROFIT PLANNING: Introduction, Financial planning, Profit planning, Objectives of profit planning, Essentials of profit planning, Budget administration, type of budgets, preparation of budgets, advantages, problems and dangers of budgeting.

6 Hours

TEXT BOOKS:

1. **Engineering Economy**, RIGGS J. L., Mc. Graw Hill, 2002.
2. **Engineering Economy**, THUESEN H. G., PHI, 2002.

REFERENCE BOOKS:

1. **Engineering Economy,** TARACHAND.
2. **Industrial Engineering and Management**, O. P. KHANNA, Dhanpat Rai & Sons.
3. **Financial Management**, I. M. PANDAY, Vikas Publishing House.
4. **Engineering Economy**, PAUL DEOARMO, Macmillar Pub. Co., 2001.

SMALL SCALE AND MARINE MINING

Subject Code	:	**06MN663**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO SMALL SCALE MINING: Concept of small-scale mining, small scale mines – worldwide Indian Policy in small scale Mines – Practices, policies and prospective, problems of small scale mines finance, Legislative support technical expertise.

7 Hours

UNIT - 2

ENVIRONMENTAL ASPECTS: Environmental obligations safety health and training, Environmental impacts and protection.

6 Hours

UNIT - 3

SMALL SCALE MINING METHODS: Classification and mode of occurrence of granite and minor minerals, physical, mechanical and chemical properties. Geological aspects of mining, granite and dimensional stone mining – manual, semi mechanized mining and mechanized mining processing, finishing, quality control, marketing and export of minerals.

7 Hours

UNIT - 4

SOME CASE STUDIES OF MINING: Mica, Barites, Diamond and Gemstones etc.

6 Hours

PART - B

UNIT - 5

INTRODUCTION TO MARINE MINING: Introduction to marine environment, characteristics of ocean floor, profile of the sea, continental shelf, slope and rise, nature of deposits of nectic, Bathyl and abyssal environments, coastal zone.

7 Hours

UNIT - 6

MARINE GEOLOGY AND RESOURCES: Introduction to marine geology, marine mineral resources mineralogical students of continental slope, continental shelf and deep sea-bed mineral resources.

7 Hours

UNIT - 7

EXPLOITATION OF MARINE DEPOSITS: Exploitation systems of dissolved an undissolved mineral deposits, shallow water mining upto 200 mts depth direct picks up and transport.

6 Hours

UNIT - 8

DEEP SEA MINING: Deep sea mining upto 2000 mts. Mining of manganese nodules, under water vehicle. Crabs, transportation.

6 Hours

TEXT BOOKS:

1. **Small Scale Mining Global Overview**, Ghose A. K. (Ed) Oxford – IBH Publishers, 1991.
2. **Coastal and Deep Ocean Dredging,** Herbich J. B. Gulf Publishing Co. Houston.

REFERENCE BOOKS:

1. **An Introduction to Mineral resources**, Chatterjee S. K. Wiley Eastern Ltd., 1993.
2. **Marine Geology**, Shepherd F.P. Sub –Harper and Row New York, 1963.
3. **Introduction and offshore Structure, Design, Fabrication and Installation**, Graff, W. J. Gulf Publishing Company, London, 1963.

MINERAL PROCESSING LABORATORY

Subject Code	:	**06MNL67**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. **Sampling:**
   a. Coning and quartering
   b. Riffle Sampling
2. **Sieve Analysis:**
   a. Wet sieve analysis and interpretation of data
   b. Dry sieve analysis and interpretation of data
3. Determination of energy consumption as a function of size reduction.
4. Determination of actual capacity of a jaw crusher.
5. Determination of actual capacity of a crusher.
6. Study of effect of the following variables on grinding in a ball mill.
   i) Pulp density
   ii) Time of grinding
   iii) Percentage of critical speed.

PART - B

7. Determination of grind ability index of the given ore.
8. Determination of free settling velocities of quartz particle and comparison of the results with theoretical results.
9. Determination of the effect of different flocculating agents on the settling rate of the pulp.
10. Separation of heavier from the given feed using mineral jig and calculation of ratio of concentration.
11. Study of the particle movement on the deck of an operating table.
12. Study of the flotation of characteristics of the sulfide ore and calculate the ratio of concentration.
13. Study the flotation of an oxide ore and calculate the ratio of concentration.

MINE ENVIRONMENTAL ENGINEERING LABORATORY

Subject Code	:	**06MNL68**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. Study of flame safety lamp, assess the percentage of gases, electric safety lamps and cap lamp room layout.
2. Study of hygrometer and measurement of relative humidity of moisture content of air, anemometer and measurements. Kata thermometer and determination of cooling efficiency.
3. Study of gas sampling equipment and determination of CO (MSA CO detector and other equipment).
4. Study of different pressure measuring instruments and measurement of pressure difference, study of ventury, evasee and diffuser.
5. Study of different types of fans and their characteristic curves, fans in series and parallel.

PART - B

6. Study of principle construction and operational details of various types of fire Extinguishers.
7. Study of construction operational details of dust collectors.
8. Study of dust samplers.
9. Study of self contained breathing apparatus and its reducing valve mechanism, reviving apparatus, self rescuers, and short distance apparatus.
10. Study of air-conditioning plants and spot cooler in mines.

VII SEMESTER

MINE PLANNING AND DESIGN

Subject Code	:	**06MN71**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

GOVERNMENT ROLE AND INFLUENCE IN MINING: Social-Legal-Political – Economic impacts, mining law, Health and safety standards. Environmental consequences.

7 Hours

UNIT - 2

MINE DEVELOPMENT: Land Acquisition, Plant silting and construction, environmental Protection and Permission, impoundments and dams.

7 Hours

UNIT - 3

PLANNING OF COAL MINES: Principles of mine planning, stages of planning of new mines, selection of mine sites, geological aspects, division of a coal field into mining areas.

6 Hours

UNIT - 4

Surface layouts, pit bottom layout, transport system. Application of computer to mine planning.

6 Hours

PART - B

UNIT - 5

OPENING UP COAL DEPOSITS: Mining Area, term of life and mine capacity, division of mining property into parts, length, number and position of productive Longwall faces, dimensions of development workings, costs of various mining operations.

7 Hours

UNIT - 6

OPENING UP WITH: Adits, inclines. Opening up with vertical shafts, open up with shafts and cross measure drifts. Choice of method of opening up by various methods.

7 Hours

UNIT - 7

MINE EXPLOITATION: Mining methods, classification systems, computer methods, mine closure, sealing and abandonment.

6 Hours

UNIT - 8

NOVEL AND INNOVATIVE: Mining Methods. Evaluation of Mining Methods and Systems**.**

6 Hours

TEXT BOOKS:

1. **Advanced Coal Mining** – B. M. Vorobjev & R. T. Deshmukh, Asia Publishing House, Bombay 1966.
2. **Introductory Mining Engineering** – Hartman, John Wiley and Sons Inc. 1987.

REFERENCE BOOKS:

1. S.M.E. **Mining Engineering Handbook**, Vol. I & II. Hartman, Society for Mining metallurgy and Exploration Inc. 1992. (Sections 3, 6, 7, 8, 22 and 23).
2. **Underground Winning of Coal** – T. N. Singh, Oxford IBH, 1992.
3. **Modern Coal Mining Technology** – S. K. Das, Lovely Prakashan, Dhanbad, 1996.
4. **Principles & Practices of Modern Coal Mining** – R.D. Singh, New Age International (P) Ltd. Publishers, 1997, Section 16.
5. **Mine Planning for Coal** S. P. Mathur, MG Consultants Bilaspur, 1993.
6. **Mining** B. Boky Mir Publishers, 1967.

GROUND CONTROL

Subject Code	:	**06MN72**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Definition, types of underground excavation, excavation design and constraints. Influence of water, time and temperature on stress behavior. Theories of rock failure: Griffith's, Columb Navier, Mohr's, Hoek & Brown.

6 Hours

UNIT - 2

SUBSIDENCE: Theories, factors affecting subsidence, prediction, monitoring and determination. Subsidence damage and preventive measures.

6 Hours

UNIT - 3

STABILITY OF ROCK EXCAVATIONS: Re-inforcement of mine fills, autoconsolidated rock fill, cemented sand fill and rock fill, chemical activators in fill cementation.

6 Hours

UNIT - 4

ANALYSIS OF STRESS AROUND UNDERGROUND EXCAVATION: Introduction, Premining and Induced Stresses, stress distribution around single excavation, circular, multiple, pillar and irregular shapes. Analytical approaches: Introduction, numerical models, finite element method (FEM), BEM, DEC, Photoelasticity.

8 Hours

PART - B

UNIT - 5

CLASSIFICATION OF ROCK MASSES: Introduction, methods and approaches: Terzaghi, RQD, RSR, RMR, Q, NATM, ISRM, Limitations.

7 Hours

UNIT - 6

TYPES OF SUPPORTS AND THEIR DESIGN: Conventional and Powered supports, Rock Bolting, Roof Trusses, Shotcreting, Fibre supports, Support layouts, estimation of support resistance, Rock Structure interaction, timber, steel, concrete and cable bolt supports and design aspects.

7 Hours

UNIT - 7

INSTRUMENTATION AND MONITORING: Types of stress strain measuring instruments: loadcells, strain gauges, convergence measurement instruments, dilatometers, extensometers, optical gauges, compressometers, methods of monitoring and their limitations.

6 Hours

UNIT - 8

MISCELLANEOUS: Rock burst and coal bumps: Mechanism, causes, occurrence, estimation of damage, prediction and preventive measures. Cavability, goaf control. Design of single and multiple openings.

6 Hours

TEXT BOOKS:

1. **Rock Mechanics and the Design of Structures in Rocks**, L. Obert and W. I. Duvall, John Wiley and Sons, 1966.
2. **Coal Mine Ground Control**, S. Peng, John Wiley and Sons, Inc. 1978.

REFERENCE BOOKS:

1. **Mining Engineering Hand Book -** S.M.E. Volume I and II, Society for Mining, Metallurgy & Exploration. Inc. 1992.
2. **Underground Mining Methods Hand Book -** W.A. Hustralid, Society for Mining, Metallurgy & Exploration Inc. 1982.
3. **Ground Mechanics in Hard Rock Mining -** M. L. Jeremic, Oxford & IBH Publishing Co. New Delhi, 1986.
4. **Design of Supports in Mines** - C. Biron & E. Arioglu, John Wiley & Sons, New York, 1983.
5. **Underground Mining Methods and Technology -** Proceedings of the International Symposium, Nottingham, Elsevier 1986.
6. **Coal Mining Technology Theory and Practice** - Robert Stefanko SME 1983.
7. **Underground Excavations in rock** - E. Hoek and E. T. Brown IMM, 1980.
8. **Support of Underground Excavation in Hard Rock** - E. Hoek et. al., Oxford and IBH 1995.

COMPUTER APPLICATION IN MINING

Subject Code	:	**06MN73**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

COMPUTER AIDED DESIGN: Introduction, Fundamentals of CAD, design Process, application of Computers for Design. Creating the Manufacturing Data Base. Benefits of Computer – Aided Design.

6 Hours

UNIT - 2

HARDWARE IN COMPUTER – AIDED DESIGN: Introduction, design Workstation, Graphics Terminal. Operator Input Devices. Plotters and Other Output Devices. Central Processing Unit. Secondary Storage.

7 Hours

UNIT - 3

COMPUTER GRAPHICS SOFTWARE AND DATABASE: Introduction, Software Configuration of a Graphics System, functions of a Graphics Package, Constructing the Geometry. Transformations. Data base Structure and Content. Wire-frame Versus Solid Modeling. Other CAD Features. Application of Computers in Mining Industries.

7 Hours

UNIT - 4

ALGORITHMS-1: Development of algorithms in Ore Reserve Estimation. Equipment Selection. Material Handling System. Pit Configuration. SARPAC

6 Hours

PART - B

UNIT - 5

ALGORITHMS-II: Blast Design. Pillar Design. Subsidence Protection, Ventilation Network Analysis. Ground Vibration Prediction from Blasting.

6 Hours

UNIT - 6

DATA BASE MANAGEMENT SYSTEM: Introduction: Database Approach versus traditional file processing Approach, DBMS administrators. Designers users. Developers and maintenance, uses of DBMS, Datamine Package.

DATABASE SYSTEM CONCEPTS AND ARCHITECTURE: Architecture, Data Models, Schemes and Instances, Architecture and Data Independences, Database languages and Interfaces, Classification of Management Systems. Entity-Relationship Model: Entitites, Attributes, Key Attributes, relationships, Roles. Structural Constants, Weak Entity Types, E-R Diagram.

7 Hours

UNIT - 7

RELATIONAL DATA MODELS AND RELATIONAL ALGEBRA: Relational Models concept, relational Algebra, Additional Relational Operators, queries in the Relational Algebra.

6 Hours

UNIT - 8

SQL - A RELATIONAL DATABASE LANGUAGE: Data Definition in SQL, views in SQL, queries in SQL. Queries. Database Design: Normal forms based of primary keys, First, Second, Third normal forms. BCNF.

7 Hours

TEXT BOOKS:

1. **Fundamentals of Database Systems**, Elmarsi and Navathe, 3rd edition, Wesley 2000.
2. **CAD/CAM : Computer Aided Design and Manufacturing**, Mikell P. Groover, Emory W. Zimmers, Jr. PHI Inida, 1989.

REFERENCE BOOKS:

1. **Mine Ventilation and Air** - Conditioning, Hartman, Wiley International, 1961.
2. **Mine Environmental Engineering -** V.S. Vutukuri & Lama, Cambridge University Press, 1986.
3. **Database System Concepts** - Korth, Mc Graw Hill, 1986.
4. **CAD/CAM Theory and Practice** by Zeid, Tat Mc. Graw Hill.

OPERATION RESEARCH

Subject Code	:	**06MN74**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Definition of OR, OR methodology, Application of OR to engineering and Managerial problems, Features and Limitations of OR.

4 Hours

UNIT - 2

LINEAR PROGRAMMING: Definition, mathematical formulation, standard form, solution space, solution-feasible, basic feasible, optimal, infeasible, multiple, optimal, Redundancy, Degeneracy, Graphical and Simplex methods.

8 Hours

UNIT - 3

VARIANTS OF SIMPLEX ALGORITHM: Artificial basis techniques. Duality, Economic interpretation of Dual, Solution of LPP using duality concept, Dual simples method.

6 Hours

UNIT - 4

TRANSPORTATION PROBLEM: Formulation of transportation model. Basic feasible solution using different methods. Optimality Methods, Unbalanced transportation problem, Degeneracy in transportation problems.

Applications of Transportation problems. **Assignment Problem**: Formulation, unbalanced assignment problem. Traveling salesman problem.

8 Hours

PART - B

UNIT - 5

QUEUING THEORY: Queuing system and their characteristics. The M/M/I Queuing system, Steady state performance analyzing of M/M/I and M/M/C queuing model.

6 Hours

UNIT - 6

Project Management Using Network Analysis: Network construction, determination of critical path and duration, floats. PERT – Estimation of project duration, variance.

7 Hours

UNIT - 7

CPM – Elements of crashing, least cost project scheduling. Flow in networks: Determination of shortest route. Determination of Maximum flow through the networks.

7 Hours

UNIT - 8

GAME THEORY: Formulation of games. Two Person - Zero sum game, games with and without saddle point. Graphical solution (2Xn, mX2 game), dominance property.

6 Hours

TEXT BOOKS:

1. **Operations Research and Introduction**, Taha H. A. –Mc. Millan. ISBN -0-02-418940-5.
2. **Principles of Operations Research – Theory and Practice**, Philips, Ravindran and Soleberg –PHI.

REFERENCE BOOKS:

1. **Introduction to Operation Research -** Hiller and Liberman, Mc. Graw Hill Vth Edition.
2. **Operations Research -** S. D. Sharma –Kedarnath, Ramnath & Co.
3. **Operations Research Theory and Application -** J. K. Sharma, 2nd Edn, ISBN – 0333-92394-4.
4. **Operations Research** - Kanthi Swarup & Others –Sultanch and Sons.

ELECTIVE-II (Group B)

ADVANCED SURFACE MINING

Subject Code	:	**06MN751**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

PLANNING: Land Acquisition, detailed prospecting and delineation of ore bodies. Concept of Cut off grade for the estimation of ore reserves, quality control and conservation, out put and man power planning.

8 Hours

UNIT - 2

PIT LAYOUT: Preparation of the site, selection of site for initial box cut, numbers, length, width, height and direction of benches.

6 Hours

UNIT - 3

LAYOUTS DESIGN: Pit layout plotting for different equipment's combination, calendar planning.

6 Hours

UNIT - 4

INTRODUCTION TO SLOPE FAILURE: Factors affecting the stability of a slope, different types of slope failure-plane, wedge, circular failure and toppling.

6 Hours

PART - B

UNIT - 5

ANALYSIS OF SLOPE STABILITY: Factor of safety calculation for plane failure and wedge failure, analysis of circular failure using circular failure charts.

6 Hours

UNIT - 6

CHOICE, TYPE AND DEGREE OF MECHANIZATION: Selection of Continuous and Discontinuous Opencast Mining machineries. Selection of drills, selection of size and population of shovel, dumper, dragline, bucket wheel excavators basing on the amount of material to be handled, out put data and cycle time, continuous surface miner and its applicability.

8 Hours

UNIT - 7

SAFETY ASPECTS: Safety Aspects in Opencast Mines Regarding height, width and slope of the benches, fly rocks, mine illumination. Ground Vibrations due to Blasting.

6 Hours

UNIT - 8

DESIGN OF HAUL ROAD AND SPOIL DUMP: Design Aspects of haul roads, selection of site for spoil dumps, design aspects for spoil Dumps, stability of Spoil dumps.

6 Hours

TEXT BOOKS:

1. **Surface Mining Technology** - S. K. Das, Lovely Prakashan, Dhanbad, 1994.
2. **Surface Mining** by G.B. Mishra, Dhanbad Publishers, Dhanbad, 1978.

REFERENCE BOOKS:

1. S.M.E. **Mining Engineering hand Book** Vol. I and II, Hartman, Society for Mining, Metallurgy and Exploration Inc. 1992.
2. **Elements of Mining Technology**, Vol. I, II and III - D. J. Deshmukh, Central Techno Publication, 1998.
3. **Method of Mining, Working Coal and Metal Mines**, Vol. I, II and III – Wood ruff S. D., Pergoman Press, 1968.
4. **Proceedings of International Symposium on Thick Seam Mining**, Indian School of Mines, Dhanbad, MMGI, 1965.
5. **Coal Mining** Vol. I, II, III and IV – Statham I.C.F., The Coxton Publication Company, 1960.
6. **Introductory Mining Engineering** – Hartman H. L. John Wiley and Sons Inc. 1987.
7. **Advanced Coal Mining** Vol. I, II – Vorobjev B. M. and Deshmukh R.T., Asia Publishing House, Bombay, 1966.

PROJECT MANAGEMENT

Subject Code	:	**06MN752**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

CONCEPTS OF PROJECT MANAGEMENT: Concepts of a Project, categories of projects, phases of project life cycle, roles and responsibilities of project leader, tools and techniques for project management.

6 Hours

UNIT - 2

PROJECT PLANNING AND ESTIMATING: Feasibility report, phased planning. Project planning steps, Objectives and goals of the project, preparation of cost estimation, evaluation of the project profitability.

6 Hours

UNIT - 3

ORGANIZING AND STAFFING THE PROJECT TEAM: Skills/ abilities required for project manager. Authorities and responsibilities of project manager. Project organization and types accountability in project execution, controls, tendering and selection of contractors.

8 Hours

UNIT - 4

PROJECT SCHEDULING: Project implementation scheduling, effective time management, different scheduling techniques, and resources allocation methods.

6 Hours

PART - B

UNIT - 5

TOOLS AND TECHNIQUES OF PROJECT MANAGEMENT: Bat (GAMTT) chart, bar chart for combined activities, logic diagrams and networks, Project evaluation and review Techniques (PERT) Planning, Computerized project management.

8 Hours

UNIT - 6

CO-ORDINATION AND CONTROL: Project direction communication in a project, MIS project co-ordination, project control requirement for better control of project or role of MIS in project control, performance control, schedule control, cost control.

6 Hours

UNIT - 7

PERFORMANCE MEASURES IN PROJECT MANAGEMENT: Performance indicators, performance improvement for the CM & DM companies for better project management, Project management and environment.

6 Hours

UNIT - 8

CASE STUDIES ON PROJECT MANAGEMENT: Case studies covering project planning, scheduling, use of tools & techniques, performance measurement.

6 Hours

TEXT BOOKS:

1. **Project Management a System Approach to Planning Scheduling & Controlling**, Harold Kerzner, CBS Publishers and Distributors.
2. **Project Execution Plan: Plan for Project Execution Interaction -** Chaudhry S.

REFERENCE BOOKS:

1. **Project Management** – Beningston Lawrence – Mc. Graw Hill – 1970.
2. **A Management Guide to PERT and CPM, WEIST & LEVY**, Eastern Economy of PHI.
3. **PERT & CPM** – L. S. Srinath, Affiliated East West Press Pvt. Ltd.
4. **Project Management with PERT and CPM**, Moder Josph and Phillips cerel r., 2nd edition, New York VAN Nostrand, Reinhold – 1976.
5. **Project Planning analysis Selection Implementation & Review** – prasanna Chandra, ISBNO-07-462049-5.
6. **Planning, Performing and Controlling Projects,** Angus, 3rd End, Pearson Education Pvt. Ltd., ISBN: 812970020.
7. **Project Planning, Scheduling & Control**, James P. Lewis, Meo Publishing Company.
8. **Project Management**, Bhavesh M. Patel, Vikas Publishing House, ISBN 81-259-0777-7
9. **Successful Project Management**, Jack Gido, James P. Clements, Vikas Publishing House, ISBN 981-243-137-3

SOFTWARE ENGINEERING

Subject Code	:	**06MN753**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Software and software engineering, phases in software engineering, process model, waterfall model, prototyping etc.

6 Hours

UNIT - 2

SOFTWARE REQUIREMENT SPECIFICATIONS: Role of SRS data flow diagrams – problems, data dictionary, structured analysis, prototyping, other CASE tools. Pseudo codes, HIPO diagrams, software tools of developments facilities.

7 Hours

UNIT - 3

PLANNING A SOFTWARE PROJECT: Cost estimation, methods, single variable models, COCOMO models-problems.

6 Hours

UNIT - 4

Project scheduling staffing and personnel planning software configuration management team structure. Quality assurance plans. Project monitoring and risk management.

7 Hours

PART - B

UNIT - 5

SYSTEM DESIGN: Module level concepts – coupling and cohesion design methodology – problem object oriented approach design specifications.

7 Hours

UNIT - 6

DETAILED DESIGN AND CODING: Module specifications, data abstractions – problem. Detailed design using process design language (PDL) – problems verification, complexity matrices – problems.

7 Hours

UNIT - 7

PROGRAMMING PRACTICES: Programming practices in coding top down & bottom up methods. Structured programming information hiding, programming style, verification – problems defensive programming.

7 Hours

UNIT - 8

TESTING: Testing fundamentals, functional and structural testing, testing process that plan, test case specifications, metrics – problems top down Vs bottom up testing, debugging techniques, compiler diagram.

5 Hours

TEXT BOOKS:

1. **An Integrated Approach to Software Engineering** - 2nd Edition, Pankaj Jalote, Norosa Publishing House, 1997.
2. **Software Engineering** - Rogers S. Pressman, Mc. Graw Hill, 1997.

REFERENCE BOOKS:

1. **Software Engineering** - Martin, L. Shooman, Mc. Graw Hill, 1993.
2. **Software Engineering Concepts** - Richard. E. Fairley, Mc. Graw Hill, 1985.
3. **Software Engineering, Environment Concepts & Technology -** Robert N. Charette, Mc Graw Hill, 1988.

ELECTIVE-III (Group C)

MINE LEGISLATION

Subject Code	:	**06MN761**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Brief historical perspective legislation in Indian Mines.

8 Hours

UNIT - 2

MINES ACT: Preliminary, Inspectors and Certifying surgeons, committee, mining operations and management of mines. Provisions to health and safety.

6 Hours

UNIT - 3

MINES ACT: Hours and limitations of employment. Leave with wages. Regulations and bylaws, penalties and procedures.

6 Hours

UNIT - 4

MINES RULES: Preliminary, committee, court of enquiry, certifying surgeons. Medical Examination of persons employed. Workmen's inspector and safety committee, health and sanitation provision, first aid and medical appliance. Employment of persons, leave with wages and overtime. Welfare amenities, registers and notices.

6 Hours

PART - B

UNIT - 5

METALIFERROUS MINES REGULATION: Preliminary returns, notices and records, inspectors and mine officials, duties and responsibilities of work men, plans and sections, means of access, ladders and ladder ways, transport of men and materials, winding in shafts, transport of men and material haulage, mine workings, precaution against dangers from fire, dust gas and water, ventilation, lighting and safety lamps, Explosives and shot firing, machinery, plants and equipments.

7 Hours

UNIT - 6

COAL MINES REGULATIONS: Preliminary returns, notices and records, inspectors and mine officials, duties and responsibilities of work men, plans and sections, means of access, ladders and ladder ways, transport of men and materials, winding in shafts, transport of men and material haulage, mine workings, precaution against dangers from fire, dust gas and water, ventilation, lighting and safety lamps, Explosives and shot firing, machinery, plants and equipments.

7 Hours

UNIT - 7

CRÈCHE RULE: Provision of crèches, standards of crèches, medical arrangement of crèches.

7 Hours

UNIT - 8

Maternity Benefit Act in Detail.

5 Hours

TEXT BOOKS:

1. **Mines Act 1952, Mines Rules 1955**, Universal Law Publishing, Pvt. Ltd., 1999.
2. **Metalliferous Mines Regulations 1961**, Universal Law Publishing Pvt. Ltd., 1999.

REFERENCE BOOKS:

1. **Legislation in Indian Mines** – A critical Appraisal Prasad and Rakesh, 5th edition Tara Printing Works, Varanasi, 1990.
2. **Maternity Benefit Act, & Mines Crèche Rules**, Universal Law Publishing Pvt. Ltd., 1999.
3. **Encyclopedia of Mining Law** – D. D. Seth. Law Publishers (India) Pvt. Ltd., Allahabad, 1999.
4. **Mine Management Legislation and General Safety**, S. Ghatak, Coal Field Publishers, Asansol, 1999.
5. **Coal Mines Regulation 1957**, Universal Law Publishing Pvt. Ltd., 1999.

OPERATIONS MANAGEMENT

Subject Code	:	**06MN762**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

OPERATIONS MANAGEMENT CONCEPTS: Introduction, historical development, trend. Information and Non-Manufacturing Systems. Operations Management. Factors affecting Productivity. International Dimensions of Productivity. The Environment of Operations. Production Systems Decisions – a look ahead.

7 Hours

UNIT - 2

OPERATIONS DECISION MAKING: Introduction. Management as a Science, characteristics of decisions. Framework for decision making. Decision methodology. Decision supports systems. Economic models. Statistical models.

6 Hours

UNIT - 3

SYSTEMS DESIGN AND CAPACITY: Introduction. Manufacturing and Service Systems. Design and Systems Capacity. Capacity Planning.

6 Hours

UNIT - 4

FORECASTING: Forecasting Objectives and Uses, Forecasting Variables, Opinion and Judgemental methods, Time Series methods, Exponential smoothing, Regression and Correlation methods, Application and Control of Forecasts.

7 Hours

PART - B

UNIT - 5

AGGREGATE PLANNING AND MASTER SCHEDULING: Introduction, Planning and Scheduling, Objectives of Aggregate Planning, Aggregate Planning Methods, Master Scheduling Objectives, Master Scheduling Methods.

7 Hours

UNIT - 6

MATERIAL AND CAPACITY REQUIREMENTS PLANNING: Overview: MRP and CRP, MRP: Underlying Concepts, System Parameters, MRP logic, System refinements, Capacity Management, CRP activities.

7 Hours

UNIT - 7

SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES: Introduction, PAC objectives and data requirements, Scheduling strategy and guidelines, Scheduling Methodology, Priority Control, Capacity Control.

Single Machine Scheduling: Concept, Measures of Performance, SPT Rule, Weighted SPT Rule, EDD Rule, Minimizing the number of tardy jobs.

6 Hours

UNIT - 8

Flow Shop Scheduling: Introduction, Johnson's Rule for 'n' jobs on 2 and 3 machines, CDS Heuristic.

Job Shop Scheduling: Types of schedules, Heuristic Procedure, Scheduling 2 jobs on 'm' machines.

6 Hours

TEXT BOOKS:

1. **Operations Management**, Monks, J.G., McGraw Hill International Editions, 1987.
2. **Production and Operations Management**, Pannerselvam R., PHI, 2002.
3. **Productions & Operations Management** by Adam & Ebert.2002.

REFERENCE BOOKS:

1. **Modern Production / Operations Management**, Buffa, Wiely Eastern Ltd. 2001.
2. **Production and Operations Management**, Chary, S. N., Tata McGraw Hill, 2002.
3. **Operations Management** by James Dilworth, 2000.

MAINTENANCE MANAGEMENT IN MINES

Subject Code	:	**06MN763**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

MAINTENANCE OF MINING MACHINERY: Objectives and types, corrective, plant, preventive and predictive maintenance. Reliability centered maintenance: upkeep of maintenance record.

6 Hours

UNIT - 2

Elements of down time of machinery. Possible cause for machine delay and production stoppage. Data selection regarding machine delay and their analysis.

6 Hours

UNIT - 3

MAINTENANCE FACILITIES IN MINES FOR MINOR AND MAJOR REPAIRS: Maintenance planning and scheduling; long and short-term maintenance plans, determining the optimal maintenance policy.

7 Hours

UNIT - 4

MAINTENANCE SCHEDULING: Maintenance scheduling by the application of network technique. Application of queuing theory in maintenance of mining equipment.

7 Hours

PART - B

UNIT - 5

DEFINITIONS OF RELIABILITY, AVAILABILITY AND MAINTAINABILITY: Possible measures to increase the availability of mining machinery. Maintenance budgeting: estimation of cost of resources required to meet the excepted maintenance load.

7 Hours

UNIT - 6

MAINTENANCE MANAGEMENT SYSTEM: Computerized documentation of plant and equipment management.

7 Hours

UNIT - 7

ADVANCED MAINTENANCE PROCEDURES AND TECHNIQUES: Online diagnostic maintenance, tribology techniques vibration and temperature monitoring of machinery.

6 Hours

UNIT - 8

Illustrative examples of maintenance of an operating underground mine and open cast mine.

6 Hours

TEXT BOOKS:

1. **Maintenance Planning and control**, Anthony Kelley, Affiliated East West Press, New Delhi 1981.
2. **Reliability Engineering**, Govil A. K., Tata Mc. Graw Hill Company, New Delhi, 1983.

REFERENCE BOOKS:

1. **Metals and Fuels on Mine Mechanization**, Special Issues of Journals of Mines, Vol. 59, 1992.

ROCK MECHANICS LABORATORY

Subject Code	:	**06MNL77**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. Preparation of rock specimens for laboratory tests.
2. Determination of uniaxial compressive strength of rocks.
3. Determination of compressive strength index of rocks by using point load tester.
4. Determination of tensile strength of rock by Brazilian test.
5. Determination of Protodyakanov index of the given rock specimen.
6. Determination of slake durability index of rocks.

PART - B

7. Determination of shear strength.

8. Determination of punch shear strength.
9. Tri-axial testing of samples.
10. Schmidt hammer test.
11. Plotting of Stereographic Hemispherical projections of Discontinuities.
12. Determination of Rock Quality Designation of rock.

COMPUTER APPLICATION IN MINING LABORATORY

Subject Code	:	**06MNL78**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

A. Learning of the following commands using a CAD package.

1. Drawing Commands: Line, arc, circle, polygon, Donut, Solid, Spline Pline, Text, M Line, ellipse, dimensioning, object snaps point, Hatch, layers, Units.
2. Editing Commands: Limits, Erase, Array, Copy, Move, Offset, Stretch, Pedit, change properties, Trim, Extend, Fillet, Chamfer, Break, Mirror, Scale, Rotate, Zoom, Pan.
3. Enquiry Commands: Id, list, Dist, Area, DB list, Status
4. Selection sets i.e. window, crossing, fence, W polygon.
5. Plotting.

PART - B

B. 8 exercises (mining drawing) using any of the above commands.

VIII SEMESTER

GENERAL SAFETY

Subject Code	:	**06MN81**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Safety conference and their impact. Safety Education and training Pit Safety committee. Management Safety Audit system.

6 Hours

UNIT - 2

SAFETY ORGANIZATION: Internal Safety Organization. Safety Policy, health and safety program, Feed back of safety method.

6 Hours

UNIT - 3

OCCUPATIONAL HEALTH: Safety and occupational health survey, notified and general miners diseases and their preventive measures. Permissible standard of dustiness.

7 Hours

UNIT - 4

VOCATIONAL TRAINING: V.T. Rules in detail, Indian Electricity Rules applicable to mines, rescue rules in detail.

7 Hours

PART - B

UNIT - 5

SAFETY RULES AND REGULATIONS: Standing order in event fire, inundation and failure of main mechanical ventilator.

6 Hours

UNIT - 6

BYE-LAWS: ANFO Explosive, A.C. mains firing, Bulk transportation of explosives, Diesel Locomotives.

6 Hours

UNIT - 7

ACCIDENTS: Classification of accidents, statistics, causes and preventive measures. Accident enquiry report for various accidents due to roof fall, blasting, machinery failure etc.

7 Hours

UNIT - 8

ACCIDENTAL PLANNING: Collection and presentation of accidental records, zero accidental planning (ZAP) and minimum accidental planning (MAP). Inspection for safety.

7 Hours

TEXT BOOKS:

1. **Legislation in Indian Mines a Critical Appraisal**, Vol. I & II, Rakesh & Prasad, Tara Book Agency, Varanasi, 1999.
2. **Mine Management Legislation and General Safety**, Ghatak, Coal Field Publishers, Asansol, 1998.

REFERENCE BOOKS:

1. **DGMS Classified Circulars**, Lovely Prakashan, 1998.
2. **V.T. Rules 1966**, Bare Act Publishers, 1999.
3. **Indian Electrical rules 1956**, Bare Act Publsihers, 1999.
4. **Mine Rescue Rules 1985**, Bare Act Publishers, 1999.

MINE MANAGEMENT

Subject Code	:	**06MN82**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

BRIEF HISTORY OF MANAGEMENT: Evolution of Management, traditional management, scientific management, contribution of pioneers to scientific management, functions of management, principles of Management. Mine management: Duties and responsibilities of mines manager.

6 Hours

UNIT - 2

ORGANIZATION AND INDUSTRIAL OWNERSHIP: Characteristics of Organization, Principles of organization, types of organization, management of conflict, management by exception, management by objective (MBO). Mine organization: Opencast and under ground mines. Industrial ownership: Definition, types of ownership, single ownership, partnership, Joint Stock Companies, co-operatives organization and State and central government owned. Mine ownership: duties and responsibilities of mine owner.

8 Hours

UNIT - 3

PERSONAL MANAGEMENT: Functions of personnel management, recruitment and selection of employees. Education and training: mines vocational training center. Communication: formal and informal communication, barriers in communication and techniques to overcome barriers and improve communication.

6 Hours

UNIT - 4

INDUSTRIAL PSYCHOLOGY AND HUMAN RELATION: Definition, scope of industrial psychology, aims of industrial psychology. Group Dynamics. Motivation: definition, characteristics of motivation, kinds of motivation, factors affecting motivation, motivational techniques, theories of motivation. Maslow's hierarchy of needs, Theory X and Y, Hawthorne experiment.

6 Hours

PART - B

UNIT - 5

INDUSTRIAL RELATIONS AND LEGISLATION: Introduction, basic requirement of industrial –relation programme. Trade unions: definition, functions of trade uniosn. Industrial disputes: causes, settlement of industrial disputes, handling of workers' grievances. Workers participation in management, work of ILO. Necessity of labour legislation, principles of labour legislation. Important provisions of factories act, payment of wages act, Workmen's Compensation act, Employee state insurance Act.

8 Hours

UNIT - 6

WORK STUDY: Definition, productivity and work study, postion of work study department in the organization, work study man, work study and the workers, work study and the management. Motion Study: Definition, aims of motion study, procedure for motion study, micro motion study, motion economy.

6 Hours

UNIT - 7

TIME STUDY: Definition, uses of time study, procedure, performance rating number of cycles to be timed, allowances, uses of time study data for wage incentives. Standard Data: Advantages, methods for determining Standard Data, work factor system, Method Time Measurement (MTM), Basic Motion Time Study.

6 Hours

UNIT - 8

MANAGEMENT INFORMATION SYSTEM (MIS): Introduction, Need for Information System, Characteristics of Good MIS, Sources of Information, application of MIS, design of MIS, development, Implementation of MIS.

6 Hours

TEXT BOOKS:

1. **Mine Management, Legislation and General Safety**, S. Ghatak, Coal Field Publishers, Asansol, 1999.
2. **Management** by Harold Koontz and Heinz Weihrich, Mc Graw Hill Company, 1990.

REFERENCE BOOKS:

1. **Industrial Organization and Engineering Economics**, Banga and Sharma, Khanna Publication, New Delhi, 1999.
2. **Legislation in Indian Mines**: A Critical Appraisal, Published by Vivek, P-8, New Medical Enclave, B.H.U., Varanasi, 1992.
3. **Modern Production Management**, Buffa, John Wiley and Sons, 1998.
4. **Industrial Management**, O. P. Khanna, Dhanpat Rai and Sons, 1999.
5. **Mine Management**, V.N. Singh, Lovely Prakashan, 2003.

ELECTIVE-IV (Group D)

MINE TRANSPORT SYSTEM

Subject Code	:	**06MN831**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

CLASSIFICATION OF MINE TRANSPORT SYSTEMS AND LAYOUTS: Techno – economics Indices. Transport by gravity. Underground conveyor transport.

8 Hours

UNIT - 2

CONVEYORS: Scraper chain conveyor, belt conveyor, special belt conveyor (cable belt) shaker and vibrating conveyors. Scrapper haulage.

6 Hours

UNIT - 3

RAIL TRACK: Construction of rail track, mines car, choice of car, resistant to motion of car, motion of car under gravity, man-riding cars.

6 Hours

UNIT - 4

ROPE HAULAGE: Equipment of rope haulage, rope haulage calculations, scope of application of a rope haulage.

6 Hours

PART - B

UNIT - 5

LOCOMOTIVE HAULAGE: Types of mine locomotives. Load Haul Dumpers. Trackless mining concepts, shuttle cars, mine trucks and their application.

6 Hours

UNIT - 6

UNDERGROUND HYDRAULICS: Hydraulic breaking, theory of transportation, hydraulic transportation by gravity and by pumps, equipment. Stowing material, transport.

7 Hours

UNIT - 7

AERIAL ROPEWAY: Construction of aerial ropeway. Principle of rope way, calculation plan and profile of ropeways.

7 Hours

UNIT - 8

MINING MACHINERY MAINTENANCE: Maintenance, management and safety. CAD, remote monitoring and control in mines and automation.

6 Hours

TEXT BOOKS:

1. **Mine Transport 1966**- N.T. Karelin, Orient Longmans, 1967.
2. **Mine Hoisting** – M.A. Ramlu, Oxford IBH, 1996.

REFERENCE BOOKS:

1. **Underground Mining Method** – W. A. Hastrulid, Society for Mining, Metallurgy & Exploration Inc. 1992.
2. **Modern Coal Mining technology**, S. K. Das, Lovely Prakashan, Dhanbad, 1996.
3. **Design of Supports in Mining**, C. Biron & E. Arioglu, John Wiley & Sons, 1983.
4. **Mine Pumps and Haulages**, S. Ghatak, 1990.
5. **Coal Mining Practice**, Vol. I to III, I.C.F. Statham, The Coxton Pub. Co. Ltd. 1960.

MINING GEOSTATISTICS

Subject Code	:	**06MN832**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO GEOSTATISTICS: Definition, Schools of geostatistics. Estimation models for mine evaluation – average method, polygonal or triangular method.

6 Hours

UNIT - 2

DETERMINISTIC MATHEMATICAL MODEL: Independent random model, trend with random noise, correlated random model and trend with correlated random residuals.

8 Hours

UNIT - 3

CORRELATED RANDOM THEORY-1: SEMI VARIOGRAM: Definition of semi-variogram, mathematical models of semi-variogram.

6 Hours

UNIT - 4

PRACTICAL PROBLEMS – Isotropy and anisotropy, stationarity, regularization, nugget effect.

6 Hours

PART - B

UNIT - 5

CORRELATED RANDOM THEORY- 2: Extension Variance and Estimation Variance: Extension and estimation variance, calculation of estimation variance, the nugget effect and estimation variance, examples, auxiliary functions.

8 Hours

UNIT - 6

CORRELATED RANDOM THEORY – 3: Kriging: Kriging and optimal valuation, kriging equations in general cases.

6 Hours

UNIT - 7

THE INTEGRATED GEOLOGICAL – GEOSTATISTICAL SYSTEM: Statistical analysis, comparative statistical analysis, geostatistical structural analysis, trend analysis, point kriging cross validation, block kriging, mineral inventory, grade – tonnage relations, examples to assess ore and metal recoveries.

7 Hours

UNIT - 8

EXAMPLE: To calculate planning cut-off grade. Optimization of drilling programme. Misclassified tonnages – actual Vs estimated. Grade control.

5 Hours

TEXT BOOKS:

1. **An Introduction to Applied Geostatistics**, Issaks and Srivastava, Oxford, IBH, 1990.
2. **Mining Geostatistics**, Jurnel, A. G. and Huigbregts, Ch. J., John Wiley and Sons, 1978.

REFERENCE BOOKS:

1. **An Introduction to Geostatistical Methods of Mineral Evaluation**, Rendu J.M. John Wiley and Sons, 1981.
2. **Geostatistical Ore Reserve Estimation**, Dravid, Michel, Mc. Graw Hill, 1977.

TOTAL QUALITY MANAGEMENT

Subject Code	:	**06MN833**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

OVERVIEW OF TOTAL QUALITY MANAGEMENT: Introduction – definition, basic approach, contribution of Gurus – Total Quality Management: TQM framework, historical review, benefits of TQM, TQM organization.

5 Hours

UNIT - 2

LEADERSHIP: Characteristics of quality leaders, Deming's philosophy, Role of TQM leaderships – Customers' satisfaction, Customers' perception, Handling customers' complaints, Feedback, Employee involvement, role of Motivation, Suggestion system, Performance appraisal Continuation Process Improvement – Juran's Trilogy, PDSA cycle, Problem Solving methods, Imai's Kaizen, Reengineering, 6 sigma.

8 Hours

UNIT - 3

TOOL & TECHNIQUES OF TQM: Bench marking, Definition, Process of bench marking, quality Management Systems, ISO – 9000 series of standards, Implementation and documentation of ISO – 9000. Introduction to QFD and QFD process, Quality by design, rationale for implementation of quality by design, TQM exemplary organization, FMEA (Failure Mode and Effect Analysis), Design FMEA and Process FMEA studies.

7 Hours

UNIT - 4

STATISTICAL PROCESS CONTROL: 7 Basic tools of quality control, Control charts for variables, Construction, interpretation, Analysis using X-R control charts, process capability estimation, process capability indices, process improvement through problem analysis (Intensive coverage with numerical problems)

6 Hours

PART - B

UNIT - 5

CONTROL CHARTS FOR ATTRIBUTES: Construction interpretation and analysis of P- Charts, NP- Chart, C- chart, U-Chart, Process

improvement through problem analysis (Intensive coverage with numerical problems).

8 Hours

UNIT - 6

PRODUCT ACCEPTANCE CONTROL: Design of Single sampling, Double sampling and Multiple sampling plans, Analysis of the characteristics of the above sampling plans, Selection of sampling plans for Product Acceptance Control through IS 2500 Part 1 and Part 2.

6 Hours

UNIT - 7

RELIABILITY AND LIFE TESTING: (Basic treatment only): reliability analysis of components, standard configuration systems like series, parallel redundancy and principles of design for reliability, Procedure for life testing.

6 Hours

UNIT - 8

EXPERIMENTAL DESIGN: One factor designs, two factor designs, Orthogonal Design, Full factorial and fractional factorial design, Thaguchi's philosophy of quality engineering, Loss function, Orthogonal array, signal noise ratio, parameter design, Tolerance design (Basic Conceptual treatment only)

6 Hours

TEXT BOOKS:

1. **Total quality Management** by Dale H. Besterfield (Etal), Pearson Education III, Edition – I, Indian Reprint, 2004.
2. **Statistical quality control** by Grant Levenworth.

REFERENCE BOOKS:

1. **Statistical Quality Control** by Douglos C. Mantego Mary
2. **Total Quality Management Texts Cases** by K. Shridhara Bhat, Himalaya Publishing House, Edition I, 2002.
3. **Quality Control and Total Quality Management** – P. L. Jain, Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.
4. **A New American TQM** – Four Practical Revolutions in Management, Shoji Shiba, Alan Graham & David Walden, Productivity Press, Portland (USA).
5. **Managing for total Quality**, N. Loothetis, Prentice Hall of India, New Delhi, 2002.

ELECTIVE-V (Group E)

DEEP MINING

Subject Code	:	**06MN841**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

ROCK PRESSURE: Rock pressure in development, rock pressure in stoping, rock burst in stoping and development.

7 Hours

UNIT - 2

GROUND CONTROL: Supports: rigid, yielding, temporary and permanent. Supports for development headings, stopes, shafts, winzes, crosscuts, stowing practices, pack wallings, concreting and self-supporting strata.

7 Hours

UNIT - 3

MINING: Stope planning, stopping sequence, minimization of rock bursts and their effects, reclamation of collapsed working.

6 Hours

UNIT - 4

METHODS: Development in highly stressed ground, special mining methods.

6 Hours

PART - B

UNIT - 5

VENTILATION: Effect of temperature, humidity and barometric pressure in deep mines, sources of heat in deep mines, methods to reduce humidity. Spot coolers air conditioning plant surface and underground. Gases in deep mines, ventilation standards, fire zones, fire seals, key points, precautions against fire.

6 Hours

UNIT - 6

DEEP WINDING: Layouts, cage versus skip hoisting, shaft equipment and multilevel winding.

6 Hours

UNIT - 7

PUMPING: Layouts, drainage, position of pump chambers, special pumps, delivery lines, capacity of pumps and pump chambers.

6 Hours

UNIT - 8

PERSONAL: Importance, experience in deep mining, welfare measures etc.,

8 Hours

TEXT BOOKS:

1. **Deep Mining** Jackspalding, Mining Publication Limited Inc. 1949.
2. **Mine Ventilation and Air Conditioning** by H. L. Hartman, Wiley International, 1976.

REFERENCE BOOKS:

1. **Mine Ventilation** by G. B. Mishra, Oxford University Press, 1996.

MINE ENVIRONMENT AND ECOLOGY

Subject Code	:	**06MN842**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Definition of Environment and Ecology. Subdivision of ecology ecosystem – classification of ecosystem, structural and functional components of ecosystem, energy flow in the ecosystem. Tropic structure, ecological pyramids.

BIO-GEO-CHEMICAL CYCLES: Types, Sulphur cycle, Phosphorous cycle, Nitrogen cycle, Carbon cycle, Hydrological cycle. Impact of human on environment. Development and preservation of ecosystem, soil conservation, soil erosion, afforrestation.

7 Hours

UNIT - 2

MINING AND THE ENVIRONMENT: Mineral Production. History of environmental problems. Range and importance of environmental problems: Nature of problems factors influencing the nature and extent of environmental impact. Visual Impact; landscape analysis, sources of visual impact, landscape planning.

6 Hours

UNIT - 3

AIR POLLUTION: Nature and effect of the main pollution's: Gaseous pollutants, like point source, Non point sources. Dust formation and movement: Measurement and monitoring, ambient measurement, source measurement, monitoring program. Effect of air pollution such as greenhouse effect. Depletion of ozone layer and its effects.

7 Hours

UNIT - 4

WATER POLLUTION: Introduction of various types of water in the mineral industries, Individual Pollutants: Specific pollution problems, such as acid mine drainage, heavy metal pollution, eutrophication, De-oxygenation.

6 Hours

PART - B

UNIT - 5

CONTROL OF AIR & WATER POLLUTION: Air pollution control, control of particulate of point source and non-point sources, control of gases-point and non-point sources and disposal of collected pollutants. Control of water Pollution: Monitoring sampling procedures, water control, handling of polluted water, water treatment water quality standards.

7 Hours

UNIT - 6

NOISE POLLUTION: Problems of noise, noise sources and levels, remedial measures. Ground vibration: Nature of ground vibration from blasting, measurement & recording, prediction of ground vibration levels, effects of ground vibrations.

7 Hours

UNIT - 7

AIR BLAST: Causes of air blast, effects of air blast, remedial measures.

6 Hours

UNIT - 8

TAILING DAMS: Construction of upstream & down stream tailing dams, construction of centerline methods & their advantages & disadvantages. Problems associated with tailing dams. Reclamation planning. Land use analysis, reclamation techniques, problems, revegetation process.

E.I.A. & E.M.P.: Base line studies, importance of environmental impact assessment, Environmental impact assessment, environmental management plan.

6 Hours

TEXT BOOKS:

1. **Environmental Impact of Mining**, C.G. Down Ph.D. and J. Stock, Second Edition Applied Science Publishers Ltd. London, 1980.
2. **Environmental management of Mining Operations**, B.B. Dhar, Ashish Publishing House, New Delhi, 1986.

REFERENCE BOOKS:

1. **Surface Mining Environment and Reclamation** A. Hussain Samya, Standard Publishers, 1998.
2. **Mine Environment and Management** (An Indian Scenario), A. B. Choudhury, Ashish Publishing House, New Delhi, 1992.
3. **Environmental Pollution Control Engineering**, C. S. Rao, Wiley Eastern Ltd. 1992.
4. **Environmental Challenges** C. K. Varshney D. R. Srdesai, Wiley Eastern Ltd. 1993.
5. **Environmental Issues in Mineral Resources Development** K. L. Rai, Gyan Publishing House, 1993.
6. **The Impact of Mining on the Environment, Problems and Solutions**, Oxford and IBH, New Delhi, 1994.
7. **Water Pollution, Causes, effects and Control,** P. K. Goel, New Age International Publishers, 1997.

ROCK EXCAVATION ENGINEERING

Subject Code	:	**06MN843**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Concepts and historical developments in rock excavation, factors affecting rock fragmentation, mechanism of rock breakage and fractures.

6 Hours

UNIT - 2

ROCK FRAGMENTATION: Method of rock fragmentation – explosive action, cutting, ripping and impacts.

6 Hours

UNIT - 3

PROPERTIES OF ROCKS FOR MACHINE PROCESS: Application of compression, tensile and multi – axial strength, index test and abrasivity, anistrophy, elasticity, porosity, lamination, bedding joints in rock fragmentation process.

7 Hours

UNIT - 4

PRINCIPLES OF ROCK CUTTING TECHNOLOGY: Drilling and its various types i.e., rotary, percussive, rotary – percussive mechanism of rock percussion, theory of single tool rock cutting, crack initiation and propagation, breakage pattern.

7 Hours

PART - B

UNIT - 5

Rock cutting pricks, discs and rolls cutter. Water jet cutting. Method of assessing drillability and cuttability of rock.

6 Hours

UNIT - 6

PRINCIPLES OF EXCAVATION MACHINES: Roadheaders, TEMs' coalface cutters loaders, Bucket Wheel Excavators and Continuous Miners both surface and underground.

8 Hours

UNIT - 7

ROCK CUTTING TOOLS: Cutting tool material – different types relative application and their choice, tool shape and size, specific energy consumption, tool wear.

6 Hours

UNIT - 8

Effect of operational parameters on tool performance, maintenance and replacement of cutting tools of excavating machines.

6 Hours

TEXT BOOKS:

1. **Principles of Rock Fragmentation**, G. B. Clark, John Wiley and Sons, New York, 1987.
2. **Rock Mechanics and Design of Structures**, Obert & Duvall, John wiley and Sons, New York, 1962.

REFERENCE BOOKS:

1. **S. M. E. Mining Engineering** Hand Book, Hartman, Society for Mining, Metallurgy and Exploration Inc. 1982.
2. **Introductory Mining Engineering**, Hartman, John Wiley International, 1976.
3. **Diamond Drilling**, C. P. Chugha, Oxford IBH, 1986.

MINING PROJECT

Subject Code	: **06MN85**	IA Marks	: 100
Exam Hours	: 03	Exam Marks	: 100

OBJECTIVES:

1. To encourage the students to work in a group so that they will develop team and leadership qualities.
2. To make the students to learn the preparation of a detailed project proposal, execution of the project and preparation and presentation of a final project report.
3. To develop in the students multi skills.
4. To develop in the students communication skills.

GUIDE LINES FOR PROJECT WORK:

1. Project can be undertaken in-house or in a industry or in a research / service organization.
2. Generally a Project batch consists of a minimum of 2 students and a maximum of 4 students.
3. The Project Synopsis should be approved within a period of 15 days by a committee consisting of Head of the concerned department as a Chairman and two senior teachers of the department of which one may be the internal guide.
4. The topic of the project may be in the same branch in which the student is studying, or it may be multidisciplinary. It may involve investigation/ analytical study / experimental work / fabrication / Statistical study / simulation etc. it may also be field oriented. The project should be preferably be taken in the latest trends in Engineering and Technology.
5. There should be a project monitoring committee in each department consisting of Head of the Department and two senior teachers of the Department.
6. Attendance for Project Work will be treated on par with any other practical / practical course.
7. Laboratory slot of 4 hours / week as indicated in the scheme is to be provided by the department.
8. The staff members will be shown a load of 3 hours (1½ units) for guiding, generally 4 batches of students.