

DMNGE – V SEMESTER TEACHING AND EXAMINATION SCHEME

Sl No	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			instruction periods per week			Total Periods per semester	Credits	Continuous internal evaluation			Semester end examination			
			L	T	P			Mid Sem . 1	Mid Sem . 2	Internal evaluation	Max Marks/ Min Marks	Total marks	Min marks for Passing including internal	
1	18MNG-501C	Mine Management and Entrepreneurship	3	1	0	60	3	20	20	20	40	14	100	35
2	18MNG-502C	Opencast Mining	3	1	0	60	3	20	20	20	40	14	100	35
3	18MNG-503C	Rock mechanics and strata control Technology	3	1	0	60	3	20	20	20	40	14	100	35
4	18MNG-504E	Elective - I	3	1	0	60	3	20	20	20	40	14	100	35
5	18MNG-505E	Elective -II	3	1	0	60	3	20	20	20	40	14	100	35
6	18MNG-506P	Opencast Mine Planning and Design Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
7	18MNG-507P	Rock Mechanics and Strata Control Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
8	18MNG-508P	Mine Environmental Engineering Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
9	18MNG-509P	C Programming Lab Practice	1	0	2	45	1.5	20	20	20	40	20	100	50
10	18MNG-510P	Project work	0	0	3	45	1.5	20	20	20	40	20	100	50
11		Skill Up gradation	0	0	7	105	2.5	0	0	Rubrics				
			19	5	18	630	25	200	200	200	400	170	1000	425

	Activities: student performance is to be assessed through Rubrics		
	18MNG 504E(A)	MINE ENVIROMENTAL ENGINEERING	Program Elective
	18MNG 504E (B)	METHODS OF WORKING METAL	Program Elective
	18 MNG 504E(C)	MINERAL PROCESSING	Program Elective
	18MNG 505E (A)	MINE LEGISLATION	Program Elective
	18MNG 505E(B)	MINE SAFETY ENGINEERING	Program Elective
	18 MNG 505E(C)	GEO-INFORMATICS AND ITS APPLICATION INMINING	Program Elective

Note: For Activities student performance is to be assessed through Rubrics.
Pass criteria: The minimum marks required for passing in any of courses are given below
1. Cumulative 35% (Mid sem 1 + Mid sem 2+ Tutorials+ End examination) and minimum marks in end examination is 35% (i.e.14marks).
2. If the cumulative of CIE is less than 35% (i.e.21 marks out of 60) therefore more than 35% of SEE is required to get overall 35%.

18MNG-501 C :: MINE MANAGEMENT AND ENTREPRENURSHIP

Course Title :	MINE MANAGEMENT AND ENTREPRENURSHIP	Course Code	18MNG-501C
Semester	V	Course Group	Core
Teaching Scheme in Periods(L:T:P)	45:15:00	Credits	3
Methodology	Lecture +assignments	Total Contact Hours :	60Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of Management and Entrepreneur skills. Students shall have Quantitative Ability to solve network analysis problems. Students shall be familiar with latest Management trends and techniques.

Course Outcomes

CO1	Interpret basic concepts of Management and Organisation
CO2	Understands Industrial Dispute Act1947
CO3	Use and Application of Recruitment& Training and Human Resource Management
CO4	Application of Material Management and Finance Management
CO5	Analyze the effect of Net work Analysis and Total Quality Management
CO6	Use of Entrepreneurship

COURSE CONTENT

Upon completion of the course the student should be able to

1. Management and Organization

Periods 10 [L : 7 T:3]

Management-Role of management in economic development of India, different types of ownership types and in mining industry, statutory requirements in setting-up of mining industry, functions of management, principles of scientific management, organization-types, organization chart of different mines,(conventional mine, long wall mine, opencast mine), participation in management, functions of trade unions, mining personnel- calculation, qualification.

2.Industrial Dispute act-1947

Periods 8 [L : 6 T:2]

Industrial Dispute Act-1947-causes and effects, provisions, definitions-works committee, voluntary organization, description of conciliation officer, board of conciliation ,court of enquiry, tribunal, factory act, ESI act, work men compensation act

3.Recruitment & training and Human Resource Management

Periods 8 [L : 6 T:2]

Recruitment-definitions and various procedures, training-definition, various types, definitions of staffing, personal management, importance of HR planning, mines vocational training.

4. Material Management and Finance Management:

Periods 10 [L : 7 T:3]

Inventory Management – objectives of Inventory Management – ABC Analysis – Economic order Quality – Purchasing – Objectives of purchasing – Functions – Procedures – Material Management ,Budget-various types, Capital-source of raising ,profit & loss account, tax - GST, excise tax, Income tax, customs tax, balance sheet

5. Net work Analysis and total quality management:

Periods 12 [L : 8 T: 4]

Introduction – CPM & PERT – various terms, critical path and project duration, comparison of CPM Vs PERT, TQM-definitions of various terms, principles of quality management, kaizen's, 6 sigma, ISO-9000 series, Indian quality standards, ISO-9000- out-standing features, draw backs, evolution, quality management system

6. Entrepreneurship

Periods 12 [L : 8 T: 4]

Entrepreneur - definition, motivating factors, rewards and risks encountered, types, theories- Abraham Maslow's theory of motivation, Leadership theories, decision making process, communication process, ssi-definition, features, steps for setting- up, product selection, site selection, demand and market surveys, techno-economic factors, various central govt. Telangana industrial policy, Break even analysis- terminology, description, problems, feasibility study report, role of banks in development of entrepreneur, financial assistance program- SC/ST women, TS- i pass.

SPECIFIC LEARNING OUTCOMES

Upon completion of the course the student should be able to

1.0 Management and Organization

- 1.1 Define the term Management
- 1.2 Explain the role of Mining industry in economic development of India
- 1.3 List the applicability of different types of ownership of industries with reference to mining.
- 1.4 List the different departments in Mining Industry
- 1.5 What are the different statutory requirements needed to set-up Mining Industry
- 1.6 Define Mine Management.
- 1.7 Explain different functions of management
- 1.8 Explain the principles of Scientific management by F.W.Taylor and Henry Fayol
- 1.9 Define Organization
- 1.10 List the Types of organization :a) Line b) Line & staff c) Functional d) Project
- 1.11 Draw the Organization chart of large conventional underground mine
- 1.12 Draw the Organization chart of large mechanized Long wall mine
- 1.13 Draw the Organization chart of large mechanized Opencast mine
- 1.14 Explain about the workers participation in mine management-objectives, means of participation
- 1.15 What are the functions of trade unions.
- 1.16 Explain Calculation of mining personnel.

- 1.17 Determine the Qualification of personnel based on given out-put as per CMR\MMR
- 1.18 Explain the Forms of ownership
 - i) Proprietorship ii) Partnership iii) Joint stock iv) Co-operative Society v) Govt. Sector

2.0 Industrial Dispute Act-1947

- 2.1 Define the term Industrial Dispute Act-1947
- 2.2 List various causes and adverse effects of Industrial Dispute
- 2.3 List various provisions of ID Act.
- 2.4 Define the terms works committee, voluntary organization, strike and lock-out
- 2.5. State the various types of training procedures (Induction, Skill Enhancement)
- 2.7 Explain the Conciliation Officer and Board of Conciliation.
- 2.8 Explain the Court of Enquiry
- 2.9 Explain the Industrial Tribunals
- 2.10 Explain the importance of various Acts – Factory Act, ESI Act, Workmen Compensation Act, Industrial Dispute Act etc.

3.0 Recruitment & Training and Human Resource Management

- 3.1 Define the terms recruitment and training
- 3.2 Explain the various Recruitment Procedures.
- 3.3 List the various types of training procedures (Induction, Skill Enhancement etc)
- 3.4 Explain the need for Training & Development.
- 3.5 Define Staffing
- 3.6 What is the importance HR Planning
- 3.7 Define Personal Management .
- 3.8 Explain the functions of Personal Management
- 3.9. Explain mines vocational training for different category personnel.

4.0 Materials Management and Finance Management

- 4.1. Define Inventory Management (No Numerical).
- 4.2 List the objectives of Inventory Management.
- 4.3 Explain ABC Analysis.
- 4.4 Explain Economic Order Quantity.
- 4.5 Explain the Graphical Representation of Economic Order Quantity.
- 4.6 List the objectives of Purchasing.

- 4.7 Explain the functions of Purchase Department.
- 4.8 Explain the steps involved in Purchasing.
- 4.9 Explain the Modern Techniques of Material Management.
- 4.10 Define Budget
- 4.11 Explain Production Budget and Labour Budget
- 4.12 List the types of capitals
- 4.13 List source of raising capital
- 4.14 Explain Profit & Loss Account
- 4.15 Explain Excise Tax, GST, Income Tax, Customs Duty
- 4.16 Explain Pro-forma of Balance sheet

5.0 Net work analysis and Total Quality Management

- 5.1 Define network analysis.
- 5.2 List the objectives of network analysis
- 5.3 Define various terms CPM ,PERT ,Activity, Predecessor event, Merge and burst event, dummy activity
- 5.4 Identify the critical path and find the project duration.
- 5.5 List the merits and demerits of CPM & PERT
- 5.6 Explain the CPM & PERT Techniques of Project Management.
- 5.7 Compare CPM Vs PERT
- 5.8 Define the terms Quality, Quality policy, Quality control, Quality Circle, Quality assurance, Quality management
- 5.9 Explain the principles of Quality Assurance.
- 5.10 Explain the concepts of TQM , Kaizen 5's and 6 sigma.
- 5.11 Explain Quality Audit.
- 5.12 Explain the evolution of ISO 9000 series
- 5.13. Explain the various Quality Management systems
- 5.14 Explain ISO 9000 series of quality systems, Indian Standards on Quality systems
- 5.15 List the Out-standing features and draw-backs of ISO 9000 series

6.0. Entrepreneurship

- 6.1 Define the terms entrepreneur, entrepreneurship and enterprise
- 6.2 List the factors that motivate entrepreneur
- 6.3 List the risks and rewards encountered by entrepreneur in respect of finance, career and personality
- 6.4 List the requirements of entrepreneur
- 6.5 Mention the important types of entrepreneur and their meaning
- 6.6 Explain different theories of Leadership
- 6.7 Explain the Maslow's theory of Motivation
- 6.8 Explain decision making process
- 6.9 Explain communication process
- 6.10 Define Small scale industry
- 6.11 List the features of SSI
- 6.12 Explain the method of product selection
- 6.13 Explain the method of site selection
- 6.14 List the financial assistance programs
- 6.15 Explain the important steps involved in starting an SSI
- 6.16 Define a start up company
- 6.17 Explain demand and market surveys
- 6.18 Evaluates Techno-economic factors
- 6.19 Mention the various Central government institutions and their functions (like NSIC , SIDO, SISI_SSIB)
- 6.20 Explain Telangana state industry policy
- 6.21 Explain the Break-Even Analysis
- 6.22 Explain the terminology used in Break-Even Analysis
- 6.23 Solve simple numerical problems on Break-Even Analysis
- 6.24 Explain Feasibility Study Report
- 6.25 Explain the role of Banks in the development of entrepreneur
- 6.26 Mention Special assistance schemes for women and SC/ST entrepreneurs

6.27 Mention the features of TS –I pass

Suggested student Activities:

1. Case Studies: The students will do the project work in Management in SCCLtd.
2. Assignments: The students are given topics in different Management topics..
3. Seminars: The students will give Seminars on Management.
4. Field Visits: Students will visit nearby Organizations like SCCLtd.
5. Workshops: Students will participate in Workshops conducted by various Organizations.
6. Sketch Books: Students will write sketch books also.

REFERENCE BOOKS

1. Mine Management by S. Ghatak
 2. Mine Management by V.N.SINGH
 3. Industrial Engg & Management by Dr. O.P. Khanna - Dhanpath Rai & sons New Delhi
 4. Business Administration & Management Dr. S.C.Saxena & W.H.Newman & E.Kirby Warren- Sahitya Bhavan Agra
 5. The process of Management by Andrew R. McGill - Prentice Hall
 6. Industrial Management by Rustom S. Davar - Khanna Publication
-

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
					11(b)	15(b)	
6	VI			7,8	10(b)	14(b)	
		12(a)			16(a)		
		12(b)			16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

Suggested E-learning resources

1. <https://elearningindustry.com>
2. <https://www.commlabindia.com/resources>
3. <https://www.skillsoft.com/online-learning-resources>
4. www.edumine.com

CO-PO MAPPING MATRIX

Course Outcome		CL	Linked PO	Teaching Hours
CO1	Management and Organization	R/U	1,2,5	10
CO2	Industrial Dispute Act-1947	R/U/A	1,2,5,7	08
CO3	Recruitment& Training and Human Resource Management	R/U/A	1,25,,9,10	08
CO4	Material Management and Finance Management	R/U/A	1,2,5,7	10
CO5	Network Analysis and Total Quality Management	R/U/A	1,2,5,10	12
CO6	Entrepreneurship	R/U/A	1,2,3,7,10	12

MID-I

Model Paper

Sub Code: 18MNG501C

Sub Name: MINE MANAGEMENT & ENTREPRENEURSHIP

Semester: V Semester

Time: 01 hour

Max. Marks: 20

PART-A

1x4=4

Note: Answer All question

1. Define Mine Management.
2. Define Organization
3. List various provisions of ID Act.
4. Define the terms works committee

PART-B

3x2=6

5. (a) List the different departments in Mining Industry
OR
(b) Explain different functions of management
6. (a) List various causes of Industrial Dispute
OR
(b) State the various types of training procedures

PART-C

5x2=10

7. (a) Determine the Qualification of personnel based on given out-put as per CMR assuming your own conditions
OR
(b) Draw the Organization chart of large conventional underground
8. (a) Explain the Conciliation Officer and Board of Conciliation.
OR
(b) Explain the importance of Factory Act and, ESI Act

MID-II

Model Paper

Sub Code: 18MNG501C

Sub Name: MINE MANAGEMENT & ENTREPRENEURSHIPs

Semester: V Semester

Time: 01 hour

Max. Marks: 20

PART-A

1x4=4

Note: Answer All question

1. Define the term recruitment
2. Define Personal Management
3. List the objectives of Inventory Management.
4. List the types of capitals

PART-B

3x2=6

5. (a) What is the importance of HR Planning
OR
(b) Explain the need for Training & Development .
6. (a) List the objectives of Inventory Management.
OR
(b) Explain Profit & Loss Account

PART-C

5 x 2 = 10 Marks

7. (a) Explain the functions of Personal Management
OR
(b) Explain mines vocational training for different category personnel.
8. (a) Explain the functions of Purchase Department.
OR
(b) Explain Production Budget and Labour Budget

Semester End Examination

Model Paper

Sub Code: 18MNG501C

Sub Name: MINE MANAGEMENT & ENTREPRENEURSHIPS

Semester: V Semester

Time: 2 hours

Max Marks:40

PART-A

1x8=8

Note: Answer All question

1. Define the term Management
2. Define the term Industrial Dispute Act-1947
3. Define the term Quality control
4. Define Personal Management
5. Define network analysis.
6. Define the terms activity.
7. Define the term of entrepreneur
8. List the features of SSI

PART-B

3x4=12 Marks

9. (a) Functions of trade unions.
OR
(b) List the objectives of network analysis
10. (a) State the Forms of ownership
OR
(b) List the factors that motivate entrepreneur
11. (a) Explain Quality Audit.
OR
(b) Explain the various Quality Management systems
12. (a) Explain decision making process
OR
(b) List the financial assistance programs

PART-C

5x4=20 Marks

13. (a) Draw the Organization chart of large mechanized Opencast mine

OR

(b) Draw the network and find project duration for the following project. Identify the critical path.

Activity	1-2	1-3	1-4	2-5	3-5	3-6	4-6	5-7	6-7
Time in months	1	3	4	3	4	5	5	5	2

i) Prepare the network ii) Identify critical path iii) Calculate the project completion time.

14. (a) Explain the various Recruitment Procedures.

OR

(b) Explain the Maslow's theory of Motivation

15. (a) Explain ISO 9000 series of quality systems

OR

(b) Explain the concepts of TQM

16. (a) Explain demand and market surveys

OR

(b) Explain the Break-Even Analysis

.....

18MNG-502C- OPENCAST MINING

Course Title	OPENCAST MINING	Course Code	18MNG-502C
Semester	V	Course Group	Core
Teaching Scheme in Periods(L:T:P)	45:15:0	Credits	3
Type of Course	Lecture + Assignments	Total Contact Periods :	60
CIE	60 Marks	SEE	40 Marks

Pre requisites

Basic knowledge of Mining Geology and Engineering Drawing and environmental engineering

Course Outcomes

A student who has completed this Course will be able to:

CO1 :	Appreciate the Opencast method of mining
CO2 :	Plan and supervise drilling and blasting operations in mining following safe practices
CO3 :	Analyze transportation equipments
CO4 :	Choose the excavators for a mining
CO5 :	Plan the Opencast mine layouts. Apply the concepts in the design and development of opencast mining.
CO6 :	Knows the environment impact due to opencast and Analysis on Slope stability

COURSE CONTENT

UNIT:I

Introduction to Opencast mining

Duration: 6 Periods (L: 4– T: 2)

Definition, different forms– Different terminology with sketches –major coal and metal OC mines-Geo mining situation under which surface Mining adopted , major coal and metal opencasts – Limitations – merits and demerits --Preparation of ground, de-vegetation – clearance – Formation of OB Benches – Coal benches – Drilling – blasting – loading – transportation – back filling

UNIT:II

Drilling and Blasting Techniques

Duration: 14 Periods (L: 10– T: 4)

parameters connected to drilling of blast holes - pattern of drill holes - vertical inclined drilling – merits – demerits – application--estimation of charges for Blasting round of holes – Blasting tools for shot firing procedure-Firing Patterns – Transportation, storage, charging of bulk explosives--Use of accessories such are NONELS, electronic detonators, Boosters, Detonating cords-- methods of giving connection and firing procedure - Use of bulk explosives such are SME/ SMS-- deck charging and its applicability -Controlled blasting techniques to Control of fly rocks, vibrations sound, dust generation - Muffled blasting, cushion blasting .chamber blasting and Deck blasting and their applicability-- Conditions for adopting sleeping hole-Secondary Blasting-Pop shooting, plaster blasting - Dangers due to blasting practice in open cast mines--preventive measures due to blasting practice in open cast mines.

UNIT:III

Transportation system in open cast mines Duration: 7 Periods (L: 5– T:2)

Factors influencing the selection of transporting system - Types of Transport system (Dumpers, belt conveyors, rails, Pipeline transport, high angle sand witch conveyors and aerial rope ways) - Types of Dumpers - construction of dumper - Belt conveyors in OC Mines - Applicable conditions, merits and demerits of Inpit Crusher Technology - Inpit Crushers - Applicable conditions, merits and Working of Spreaders used in OC mines.

UNIT:IV

Machinery Employedin open cast mines

Duration: 13 Periods (L: 10– T:3)

Criteria for selection of Equipment in OC mine - Classification of HEMM deployed in OC mines (Drills, Excavators, Transport equipment, Road making equipment etc). - Application of various HEMM in OC Mines - Classification of excavators - Types of

shovels - Components and their functions of shovels - Operating parameters of shovel – operating ranges, Operation and place of application of Shovel-bucket fill factor, Swell factor, bucket factor, swing factor, cycle time, loading time - Simple Numerical problems on shovel capacity - Draglines – types-Main components and their functions - Operation and place of application - Simple numerical problems - shovel Vs Dragline - Main components and their functions, Operation and place of application, Simple Numerical problems of Bucket wheel Excavator - Applicable conditions, merits and demerits of surface miner

UNIT:V

Opencast mine Planning and Design Duration: 9 Periods (L: 6– T:3)

Factors effecting design of layouts (shape, size, dip of the deposit, depth of the pit, thickness of overburden surface topography, desired production, mechanisation, transport system, mode of waste disposal) - Layout of shovel dumper combinations in opencast mines - Layout of Dragline mining in opencast mines - Layout of surface miner in opencast mines - Layout of Bucket wheel excavator in opencast mines

UNIT:VI

Environment& Ecology , Slope stability Analysis Duration: 11 Periods (L: 8– T:3)

Definition- Impact on environment due to opencast mining operations - Various environment pollutions (water, air, land pollutions) due to mining operations - Prevention and control of various environment pollutions (water, air, land pollutions) due to mining operations –Ecology and impact on ecology due to OC Mining operations - Relationship between Environment & Ecology- EIA (Environmental Impact Assessment) - EMP land Reclamation operations in opencast mines

Slope stability- Factors influencing the slope stability of a bench - Define the terms: Slope angle, Angle of Repose, Over all slope of bench - Simple numerical problems to calculate the overall slope of the bench -Types of slope failures - Parameters required for slope design - Methods of preventing slope failures - Formula to calculate the factor of safety of bench slope - Simple numerical problems to calculate the factor of safety of bench slope

REFERENCE BOOKS

- | | | | |
|----|------------------------------|---|-----------------|
| 1. | Surfacing Mining | : | G. B. Mishra |
| 2. | Blasting in Mines | : | Samir Kumar Das |
| 3. | Surfacing Mining | : | Samir Kumar Das |
| 4. | Mine Management | : | S. Ghatak |
| 5. | Heavy earth mining Machinery | : | Amitosh De |

UNIT WISE OUTCOMES

UNIT:I

Introduction to Opencast mining

- 1.1 Define the term surface mining/ opencast mining.
- 1.2 List the different types of surface mining/ opencast mining.
- 1.3 Define the following terms related to open cast mining with sketches, outcrop, overburden, face, bench, floor of bench, toe, crust, angle of repose, stripping ratio, Break even stripping ratio, placer mining, alluvial Mining, strip mining, , slope stability, back filling.
- 1.4 List the major opencast coal mines in India.
- 1.5 List the major opencast metal mines in India.
- 1.6 List the different Geo – mining situations under which surface mining is adopted.
- 1.7 List the different merits and demerits of surface mining.
- 1.8 List the limitations of surface mining.
- 1.9 List the different stages of surface mining.
- 1.10 Explain the different stages of surface mining

UNIT:II

Drilling and Blasting Techniques

- 2.1 Explain different parameters connected to drilling of blast holes.
- 2.2 List and explain the different pattern of drill holes, based on depth and diameter. Spacing and burden of drill holes.
- 2.3 State the applications of vertical and inclined drilling, Sub grade drilling.
- 2.4 List the merits and demerits of vertical and inclined drilling.
- 2.5 Estimate the charges required for blasting a round of holes .
- 2.6 List the blasting tools used in open cast mines.

- 2.7 Explain Transportation, storage, charging of bulk explosives.
- 2.8 List the accessories used in OC blasting.
- 2.9 Explain Use of accessories such are NONELS, Raydates, electronic detonators, Boosters, Detonating cords.
- 2.10 Explain methods of giving connection and firing procedure in open cast mines.
- 2.11 Explain Use of bulk explosives such are SME/ SMS.
- 2.12 Explain the deck charging /deck loading and its applicability.
- 2.13 Explain the controlled blasting techniques to Control fly rocks, vibrations, sound, dust generation etc.
- 2.14 Explain Muffled blasting, cushion blasting .chamber blasting
- 2.15 Explain Conditions for adopting sleeping holes.
- 2.16 Define the term Secondary Blasting.
- 2.17 Explain the methods of secondary blasting pop shooting, plaster blasting.
- 2.18 List the dangers due to blasting practice in open cast mines.
- 2.19 List the preventive measures due to blasting practice in open cast mines.

UNIT:III

Transportation system in open cast mines

- 3.1 Describe the factors influencing the selection of transporting system.
- 3.2 List the types of Transport system
- 3.3 List the types of Dumpers
- 3.4 Explain the general construction of dumper with neat sketch.
- 3.5 List the applications of belt conveyors in OC Mines.
- 3.6 List the applicable conditions, merits and demerits of In pit Crusher Technology
- 3.7 Explain working of In pit Crushers
- 3.8 List the applicable conditions, merits of Spreaders
- 3.9 Explain the working of Spreaders used in OC mines.

UNIT:IV

Machinery Employed in open cast mines

- 4.1 List Criteria for selection of Equipment in OC mines
- 4.2 Give the Classification of HEMM deployed in OC mines
- 4.3 list the application of various HEMM in OC Mines
- 4.4 List the Classification of excavators.
- 4.5 List the types of shovels
- 4.6 List the components and their functions of shovels.
- 4.7 List the operating parameters of shovel
- 4.8 Define the terms Dumping height, cutting height, dumping radius, maximum digging radius, bucket fill factor, Swell factor, bucket factor, swing factor, cycle time, loading time
- 4.9 Explain the operation and place of application of shovels.
- 4.10 Simple Numerical problems on shovel capacity.
- 4.11 List types of Draglines
- 4.12 List the main components, and their functions, of Dragline
- 4.13 Explain the operation and place of application of Dragline.
- 4.14 Simple Numerical problems on Dragline capacity
- 4.15 give the Comparison of shovel Vs Dragline
- 4.16 List the main components, and their functions, of Bucket wheel Excavator
- 4.17 Explain the operation and place of application of Bucket wheel Excavator with sketch
- 4.18 Simple Numerical problems on Bucket wheel Excavator capacity
- 4.19 List the applicable conditions, merits and demerits of surface miner

UNIT:V

Opencast mine Planning and Design

- 5.1 Define the terms Box cut, Trench cut, haul roads.
- 5.2 Explain the location and Design of haul roads.
- 5.3 Define the terms curves, super elevation, dividers, berms
- 5.4 Describe the drainage system, escape lanes, lighting on haul roads.
- 5.5 Define Dumps, Explain internal and external dumps and safety berms on dumps
- 5.6 List Factors effecting design of layouts
- 5.7 How the bench height and width in manual and mechanized Opencast mining is decided
- 5.8 Explain and draw the Layout of shovel dumper combinations in opencast mines
- 5.9 Explain and draw the Layout of Dragline mining in opencast mines
- 5.10 Explain and draw the Layout of surface miner in opencast mines
- 5.11 Explain and draw the Layout of Bucket wheel excavator in opencast mines
- 5.12 Find the annual production capacity of a Shovel of bucket capacity 4.6cubic meters .Assume your own conditions
- 5.13 Find the annual production capacity of a Dragline of bucket capacity 25 cubic meters Assume your own conditions
- 5.14 Find the annual production capacity of a Bucket wheel Excavator. Assume your own conditions

UNIT:VI

Environment & Ecology, Slope stability Analysis

- 6.1 Define the term Environment
- 6.2 State the impact on environment due to opencast mining operations
- 6.3 State and explain the various environment pollutions (water, air, land pollutions) due to mining operations
- 6.4 Explain the prevention and control of various pollutions (water, air, land pollutions) due to mining
- 6.5 Define Ecology and impact on ecology due to OC Mining operations

- 6.6 Explain the Relationship between Environment & Ecology
- 6.7 Explain EIA (Environmental Impact Assessment)
- 6.8 Explain EMP (Environment Management Plan).
- 6.9 Explain land Reclamation operations in opencast mines
- 6.10 Define slope stability and Factors influencing the slope stability of a bench
- 6.11 Define the terms: Slope angle, Angle of Repose, Overall slope of bench
- 6.12 Simple numerical problems to calculate the overall slope of the bench
- 6.13 List and explain types of slope failures
- 6.14 List and explain parameters required for slope design.
- 6.15 List and explain the methods of preventing slope failures.
- 6.16 State the formula to calculate the factor of safety of bench slope
- 6.17 Simple numerical problems to calculate the factor of safety of bench slope

Suggested Student Activities

Make a Visit to any nearest mine or use the information obtained from the vocational training and Submit hand written report of 5 to 10 pages or ppts or charts etc., from the following activities or similar activities.

1. Observe the use of different types of explosives used in opencast mining, and prepare a report
2. Observe the sketches of different types of drilling patterns used in O/C Mines.
3. Observe different methods of secondary blasting in open cast mining, and prepare a report.
4. Observe and prepare report of constructional features & working methods of Bucket Wheel Excavator
5. Observe and prepare report of hydraulic excavators & rope shovel
6. Observe and prepare report on draglines
7. Observe and prepare report on dumpers
8. Observe and prepare report on stackers & reclaimers

Suggested E-Learning references

1. <http://en.wikipedia.org/wiki/Mining>
2. www.youtube.com
3. <http://www.mining-journal.com/>

4. <http://www.miningiq.com/>
5. <http://www.mining-technology.com/>
6. www.nptel.com

CO PO Mapping Matrix

On Successful completion of the course, the student will be able to attain the following Course Outcomes (COs):

Course Outcome		CL	Linked PO	Teaching Periods
CO1	Appreciate the Opencast method of mining	R/U/A	1,2,9,10	8
CO2	Plan and supervise drilling and blasting operations in mining following safe practices.	R/U/A	1,2,5,6,7,10	12
CO3	Choose the excavators for a mining.	R/U/A	1,2,7,9	8
CO4	Analyze transportation equipments	R/U/A	1,2,5,7	8
CO5	Knows the environment impact due to opencast and Analysis on Slope stability	R/U/A	1,2,5,6,10	12
CO6	Plan the Opencast mine layouts. Apply the concepts in the design and development of opencast mining.	R/U/A/An	1,2,3,7,8,10	12

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	

2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks
		R		U	A	
1	I	4	1	9(a)	13(a)	
2	II					
3	III		2	10(a)	14(a)	
4	IV					
5	V		3	5, 6	9(b)	
					11(a)	
					11(b)	
6	VI		7,8	10(b)	14(b)	
				12(a)	16(a)	
				12(b)	16(b)	
Total Questions		8		8	8	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

STATE BOARD OF TECHNICAL EDUCATION & TRAINING:TS:HYDERABD

18MNG-502C- OPENCAST MINING

V SEMESTER

MID SEMESTER – I MODEL PAPER

Time: 1 hour

Max. Marks:20

PART-A

Answer All questions. Each carries 1 mark.

4X1=4 Marks

1. List the different types of surface mining/ opencast mining.
2. Define the terms (a) Outcrop (b) Overburden
3. List the different parameters connected to drilling of blast holes.
4. List the applications of vertical and inclined drilling, Sub grade drilling.

PART-B

Answer All questions. Each carry3 marks.

2X3=6 Marks

5. (a) Explain different merits and demerits of surface mining
Or
(b) Explain different Geo – mining situations under which surface mining is adopted..
6. (a) Explain methods of giving connection and firing procedure in open cast mines.
Or
(b) Estimate the charges required for blasting a round of holes

PART-C

Answer All questions. Each carries 5 marks. 2X5=10Marks

7. (a) Explain the different stages of surface mining
or
(b) Explain the deck charging /deck loading and its applicability.
8. (a) Explain the methods of secondary blasting pop shooting, plaster blasting.
or
(b) Explain Muffled blasting, cushion blasting .chamber blasting

STATE BOARD OF TECHNICAL EDUCATION & TRAINING:TS:HYDERABD

18MNG-502C- OPENCAST MINING

V SEMESTER

MID SEMESTER – II MODEL PAPER

Time: 1 hour

Max. Marks:20

PART-A

Answer All questions. Each carry 1 mark.

4X1=4 Marks

1. List the types of Transport system used in opencast mines
2. List the applicable conditions, merits of Spreaders
3. Describe the factors influencing the selection of transporting system.
4. Define the terms (a) Dumping height (b) Cutting height of a shovel

PART-B

Answer All questions. Each carry 3 marks.

2X3=6 Marks

5. (a) List the applicable conditions, merits and demerits of In-pit Crusher Technology
Or
(b) Explain the working of Spreaders used in OC mines.
6. (a) Compare shovel Vs Dragline
Or
(b) List the applicable conditions, merits and demerits of surface miner

PART-C

Answer All questions. Each carry 5 marks.

2X5=10 Marks

7. (a) Explain the general construction of dumper with neat sketch.
Or
(b) Explain working of Inpit Crusher technology.
8. (a) Explain the operation and place of application of Bucket wheel Excavator with sketch
Or
(b) Explain the operation and place of application of Dragline

STATE BOARD OF TECHNICAL EDUCATION & TRAINING:TS:HYDERABD

V SEMESTER END EXAMINATION

MODEL QUESTION PAPER

18MNG-502C- OPENCAST MINING

Time: 2 hours

Max. Marks:40

PART-A

Answer All questions. Each carry 1 mark.

8X1=8 Marks

1. What is placer mining
2. What are the accessories used in OC blasting?
3. Define Ecology
4. What is the impact on Ecology due to OC Mining operations?
5. List the Factors effecting design of layouts
6. Define the term Trench cut
7. What is EIA
8. State the formula to calculate the factor of safety of bench slope

PART-B

Answer All questions. Each carry 3 mark.

4X3=12 Marks

9. (a) Explain the Break-Even Stripping Ratio. What is its importance in Opencast Mining?

Or

- (b) How the bench height and width in manual and mechanized Opencast mining is decided?

10. (a) Explain the working of Spreader used in OC mines

Or

- (b) Explain the Relationship between Environment & Ecology

11. (a) Explain the location and Design of haul roads.

Or

(b) Define the terms (i) super elevation (ii) divider (iii) berm

12. (a) Define slope stability and list the factors influencing the slope stability of a bench

Or

(b) List and explain types of slope failures in opencast mines

PART-C

Answer All questions. Each carry 5 mark.

4X5=20

13. (a) Why controlled blasting is used in Opencast Mining. Explain the controlled blasting techniques

Or

b) (i) Define the term Dump in open cast mining

(ii) Explain internal and external dumps and safety berms on dumps in OC mines

14. (a) Find the annual production capacity of a Dragline of bucket capacity 25 cubic meters
Assume your own conditions

Or

(b) Explain the prevention and control of various pollutions due to opencast mining

15. (a) Explain and draw the Layout of shovel dumper combinations in opencast mines. Assume your own conditions

Or

(b) Explain and draw the Layout of surface miner in opencast mines. Assume your own conditions

16 (a) Explain land Reclamation operations in opencast mines

Or

(b) List and explain preventive measures of slope failure in OC mines

@@@

18MNG-503 C: ROCK MECHANICS AND STRATA CONTROL

Course Title:	ROCK MECHANICS AND STRATA CONTROL	Course Code	18MNG-503 C
Semester	V	Course Group	CORE
Teaching Scheme in Hours(L:T:P)	45:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours:	50 Hrs / 60Pds
CIE	60 Marks	SEE	40 Marks

Rationale: Rock mechanics and strata control is an elective subject which imparts the essential knowledge for effective strata control while performing the mining activity. Hence understanding the behavior of rock mass under various stress conditions is required for day to day safe mining operations. In this course major emphasis was given on Physico-mechanical properties and behavior of rock mass which is required in the field to access the strata behavior.

PRE-REQUISITES

Basic knowledge of mathematics, physics and methods of Mining at 4th semester level

COURSE OUTCOMES

CO1:	Interpret the terminologies used in rock mechanics
CO2:	Understand the stress distribution around the opening
CO3:	Determination of Physico-mechanical properties of rocks
CO4:	Analyze the effect of mining activity on the surface topology
CO5:	Use of different supporting systems in mines under various mine conditions
CO6:	Application of stress distribution in Mining, determination of rock properties, various supporting systems used in mines

COURSE CONTENT

UNIT 1 - Introduction

Duration: 8 Periods (L:6 – T:2)

Definition of rock mechanics – Scope of Rock mechanics in mining- Application of Rock mechanics to mining field Stress-Strain-Modulus of elasticity-Relation between various Modulus of elasticity-Terms Insitu stress –Induced stress -simple numerical problems

UNIT 2 - Stress Analysis, Stress distribution in underground

Duration: 10 Periods (L:7.5 – T:2.5)

Various forces acting on block in Insitu condition — Relation between vertical and lateral stresses –Induced stresses due to Mining – Principle plane- Major Principal Stress, Minor principle stress-Diagram normal and shear stresses in a 2D model– stress distribution around a Mine workings, narrow and wider openings–Mohr's circle- simple numerical problems on lateral strain- Mohr's circle

UNIT 3 - Physico mechanical properties of rocks Duration: 10 Periods (L:7.5 – T:2.5)

Rock properties – Physical Mechanical, properties of rocks – uni-axial compressive strength – confined compressive Strength (Tri axial test) -Tensile strength shear strength – strength indices of rocks– porosity – Relation between them – methods determining shear strength. RQD (Rock Quality Designation)RMR (Rock mass rating), factors consider for estimation of RMR, Estimation of RMR, simple numerical problems for estimation of RQD, Classification of roof rock based on RMR-Tunnel Quality Index

UNIT 4 - Stress measuring devices and Subsidence

Duration: 10 Periods (L:7.5 – T:2.5)

Instruments used for measurement of stress- Flat jack method – Remote convergence recorder- Magnetic tell-tale borehole extensometer- Define term Subsidence- related terms of subsidence- the angle of draw-positive and negative- Factors influencing angle of draw- List the factors effecting subsidence - List the effects of subsidence- protective measures on surface and underground to minimise damages due to mining operations -method of subsidence measurement.

UNIT 5 - Strata control**Duration: 10 Periods (L:7.5 – T:2.5)**

Supports – Necessity – Materials used – Classification of supporting Systems – Applicability of various types of supports – Size, Shape of supports – Principle of roof bolting, stitching – Merits and demerits of bolting – Rigid and Yielding props – constructional details of Friction, Hydraulic props – Method of setting Various supports at different situations –safari supporting- Junction Supports – Clearance of Heavy roof Collapse – withdrawal of supports.

UNIT-6 Engineering Applications**Duration: 12 Periods (L:9 – T: 3)**

Application of various modulus of elasticity, Longitudinal, lateral stresses around mine opening .Application of Physico – mechanical properties of rock – Application of Rock mass classification such as RQD, RMR, Q-System. Application of stress measuring devices, deformation measuring devices – Analysing the effect of subsidence – Application of various strata control devices.

TEXT BOOKS:

1. Obert, L. and Duvall, W.I., Rock Mechanics and Design of Structure in Rock John Wiley and Sons Inc., New York, 1967.
2. Vutukuri, V.S., and Lama, R.D., Handbook on Mechanical Properties of Rocks, Vol. I, II, III and IV, Transtech Publication, Berlin, 1974/78.
3. Peng, S.S., Ground Control, Wiley Interscience, New York, 1987.
4. Rock mechanics and strata control : B.P.Verma

REFERENCES:

1. Brady, B.H.G. and Brown, S.T., Rock Mechanics, Wiley Interscience, 1985.
2. Hoek, E., and Brown, S.T., Underground Excavations in Rocks, Institute of Mining Metallurgy, London, 1980.
3. Introduction to Rock Mechanics : Richard E. Goodman, Publication -John Wiely and Sons

Suggested Students activities

1. Students should visit the mine and observe how the strata is being controlled under various conditions of the mine
2. Students should visit the laboratory and familiarize various methods of testing Physico mechanical properties of rock sample
3. Students should refer mining magazine in the Library and learn various new methods of controlling the strata
4. Quiz
5. Group discussion
6. Surprise test

e- learning Resources

1. <http://www.mining-journal.com/country/india>
2. <https://www.cmpdi.co.in/publication.php>
3. www.nptel.ac.in

SPECIFIC LEARNING OUTCOMES

Up on completion of course students will be able to

1.0 Introductory concepts and ground behaviour

- 1.1 Define the term Rock mechanics.
- 1.2 What is the scope of Rock Mechanics in Mining
- 1.3 Define the terms a) Stress b) Strain c) Poissons ratio
- 1.4 Define the terms a) Young's Modulus b) Bulk Modulus c) Rigidity Modulus
- 1.5 Define the terms a) Insitu stress b) Induced stress
- 1.6 Define the terms a) Coal Bump b) Rock bursts
- 1.7 What are the causes of Coal Bumps and Rock bursts
- 1.8 List the preventive measures of Coal Bumps
- 1.9 List the preventive measures of Rock Burst
- 1.10 Simple numerical problems in calculation of stress, strain, various modulus of elasticity

2.0 **Stress analysis and stress distribution around mine opening**

- 2.1 List different types of stresses on a block of rock in field in three-dimension space.
- 2.2 Analysis of stress and strain in three dimensions
- 2.3 Find the relation between vertical and lateral stresses
- 2.4 Derive the relation between vertical strain to the lateral strain
- 2.5 Draw the normal stress and shear stress diagram in a 2D model
- 2.6 Explain the stress distribution in a 2D model
- 2.5 Define the terms a) Cohesion b) Angle of internal friction in relation to the failure plane
- 2.6 Define the terms a) Principal Plane b) Major principle stress c) Minor principle stress
- 2.7 What is the purpose of Mohr's circle
- 2.8 Draw the Mohr's circle to represent normal stress, shear stress, major principle stress, minor principle stress, maximum shear stress
- 2.9 Draw the Mohr's envelope, and also represent the angle of internal friction, Cohesion of plane of failure
- 2.10 Explain the distribution of stresses around narrow opening
- 2.11 Explain the distribution of stresses around a wider opening or Longwall panel.
- 2.12 Define the terms a) Bed separation b) Abutment pressure
- 2.13 Simple numerical problems in calculation of lateral stress and lateral strain
- 2.14 Simple numerical problems to draw the Mohr's circle and to compute angle of internal friction, Cohesion

3.0 **Physico – mechanical properties of rock mass**

- 3.1 List Physical and Mechanical properties of Rocks.
- 3.2 What are the ISRM specifications of preparation of rock sample
- 3.3 Define the terms a) Unconfined compressive strength b) Confined compressive strength of rock specimen
- 3.4 Define the terms a) density b) porosity c) void ratio d) degree of saturation e) permeability
- 3.5 Find the relation between porosity and void ratio
- 3.6 Explain the method of determining the unconfined compressive strength of rocks.
- 3.7 Explain the method of determining the confined compressive strength of rock using tri-axial test.
- 3.8 What are the limitations of computation of tensile strength of rocks
- 3.9 Explain Brazilian test to determine the tensile strength of rocks.
- 3.10 Explain methods of determination of shear strength of rocks.
- 3.11 Define the term Rock Quality Designation (RQD)
- 3.12 Simple numerical problems to calculate RQD for a given rock specimens

- 3.13 Classify RQD ratings
- 3.14 List the factors consider for estimation of RMR
- 3.15 Classify RMR ratings
- 3.16 List the factors influencing the “Tunnel Quality Index” or Q-mass
- 3.17 Simple numerical to calculate a) Compressive strength b) Shear strength c) Tensile strength of a given rock specimen

4.0. **Stress measuring devices and Subsidence**

- 4.1. List the methods of measurement of in-situ stresses
- 4.2. Explain the flat-jack method of measuring in-situ stress of rock
- 4.3. List the methods of measurement of induced stresses
- 4.4. Explain the method of measurement of deformation of strata by remote convergence Indicator
- 4.5. Explain the method of measurement of deformation of strata by “Tell-tale borehole extensometer.
- 4.6. Define the term subsidence.
- 4.7. List different types of subsidence
- 4.8. Define the terms a) Sub critical width of extraction b) Critical width of extraction c) Super critical width of extraction
- 4.9. Define the terms related to subsidence a) Angle of draw b) Angle of break c) Subsidence trough d) Point inflection
- 4.10. Draw the profile of subsidence indicating a) Subsidence trough b) Strain profile c) Amount of subsidence d) Angle of draw e) Point of inflection
- 4.11. Define the term subsidence factor
- 4.12. List the factors influencing the amount of subsidence
- 4.13. Describe the effects of subsidence.
- 4.14. List the protective measures on surface and underground to minimise damages due to mining operations.
- 4.15. Explain the method of subsidence measurement.

5.0 **Strata control**

- 5.1 What is the necessity of supports in mines.
- 5.2 Lists the various materials used for supporting in mines, Timber, Iron and steel, Building Stone, Brick, concrete.
- 5.3 Classify the types of supporting systems.
- 5.4 Outline the applicability of props, chocks, cogs, stulls, bars, linked bars, fore-poling, roof stitching, roof bolting, roof masters, roof shields and safari supports.
- 5.5 What is the principle of roof bolting

- 5.6 Explain the systems of roof bolting and their applicability.
- 5.7 Lists the merits and demerits of roof bolting.
- 5.8 Explain the rigid and yielding props.
- 5.9 Describes the constructional details of friction and Hydraulic props.
- 5.10 Explain the method of setting props at different situations.
- 5.11 Explain the method of setting bars at different situation.
- 5.12 Explain the method of setting chocks at different situations.
- 5.13 Explain the method of Roof stitching.
- 5.14 Explain the method of Safari supporting.
- 5.15 Explain the method of supporting at roadway junction.
- 5.16 Explain the method of supporting at heavy roof collapse while clearing the debris.
- 5.17 Explain withdrawal of supports by safety prop with drawer with sketch.

6.0. Engineering Applications

- 6.1. Application of various modulus of elasticity
- 6.2. Application of stress distribution around mine opening by using longitudinal and lateral stress relationship
- 6.3. Method of drawing Mohr's circle and its field application
- 6.4. Application of various Physico – mechanical properties of rocks in the field
- 6.5. Application of Rock mass classification systems in the field
- 6.6. Application of various In-situ methods of measuring stress in the field
- 6.7. Application of various strain measuring devices in the field such as Remote convergence recorder, Tell-tale bore hole extensometer
- 6.8. Identification of various methods of subsidence under given conditions
- 6.9. Application of different methods strata control and supporting systems used in mines.

CO-PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching periods
CO1	Interpret the terminologies used in rock mechanics	R/U/A	1,2	8
CO2	Understand the stress distribution around the opening	R/U	1,2,3,4,8,9	10
CO3	Determination of Physico-mechanical properties of rocks	R/U/A	3,4,5,7	10
CO4	Analyze the effect of mining activity on the surface topology	R/U/A	3,4,6	10
CO5	Use of different supporting systems in mines under various mine conditions	R/U/A	3,4,5	10
CO6	Application of stress distribution in Mining, determination of rock properties, various supporting systems used in mines	U/A	3,4,8,9,10	12
	Total			60

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
					11(b)	15(b)	
6	VI			7,8	10(b)	14(b)	
		12(a)	16(a)				
		12(b)	16(b)				
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

Model Question Papers
V SEMESTER,
MIDSEM – I
ROCK MECHANICS AND STRATA CONTROL

Sub. Code: 18MNG-503 C

Time: 1 Hour

Max. Marks : 20

PART – A

Instructions:

Answer **all** questions. Each question carries **one** mark. 4 X 1 = 4 marks

1. Define the term Rock mechanics?
2. What is the scope of Rock Mechanics in Mining?
3. List different types of stresses on a block of rock in field in three-dimension space.?
4. Define the term “ Cohesion?

PART – B

Instructions:

Answer **the following** questions. Each question carries **three** marks 2 x 3 =6 Marks

- 5 a. Define the term In-situ stress?

OR

- b. Define the term Young's Modulus?

- 6 a. Define the Angle of internal friction in relation to the failure plane?

OR

- b. What is the purpose of Mohr's circle?

PART – C

Instructions:

Answer **the following** questions. Each question carries **five** marks 2 x 5 =10 Marks

7. a. List the preventive measures of Coal Bumps?

OR

- b. List the preventive measures of Rock Burst ?

8. a. Explain stress distribution around narrow opening?

OR

- b. Explain the stress distribution around wider opening?

V SEMESTER,
MIDSEM – II
ROCK MECHANICS AND STRATA CONTROL
Sub. Code: 18MNG-503 C

Time: 1 Hour

Max.Marks : 20

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark. 4 X 1 = 4 marks

1. List Physical and Mechanical properties of Rocks?
2. What are the ISRM specifications of preparation of rock sample?
3. List the methods of measurement of in-situ stresses
4. Define the term subsidence?

PART – B

Instructions:

Answer **the following** questions. Each question carries **three** marks 2 x 3 =6 Marks

5. a. Write in brief about “Unconfined compressive strength” of rock mass?
OR
b. What are the factors influencing the RMR and Write its classification.
6. a. Define the term “Sub critical” width of extraction ?
OR
b. List the factors influencing the amount of subsidence?

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks 2 x 5 =10 Marks

7. a. List the factors influencing the “Tunnel Quality Index” or Q-mass ?
OR
b. Find the relation between porosity and void ratio?
8. a. Explain the method of subsidence measurement?
OR
b. Explain the method of measurement of deformation of strata by “Tell-tale borehole Extensometer?

V SEMESTER EXAMINATION

ROCK MECHANICS AND STRATA CONTROL

Sub. Code: 18MNG-503 C

Time: 2 Hours

Max. Marks : 40

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark.

8 X 1 = 8 marks

1. List the preventive measures of Rock Burst
2. List different types of subsidence ?
3. What is the necessity of supports in mines?
4. List application of Rock mass classification systems in the field?
5. Lists the various materials used for supporting in mines?
6. List the application of Safari supporting?
7. List the identification of various methods of subsidence under given conditions?
8. List the Application of various Physico – mechanical properties of rocks in the field?

PART – B

Instructions:

Answer **the following** questions. Each question carries **three** marks 4 x 3 =12 Marks

- 9 a). Stress concentration at a point on the wall of a vertical shaft results in a compressive stress of 59.66 MPa. The wall rock mass has an unconfined compressive strength of 89.49 MPa. Calculate the safety factor of the shaft wall at the point?

OR

- b). Explain the principle of roof bolting?

10. a). List Physical and Mechanical properties of Rocks?

OR

- b). List the Application of various strain measuring devices in the field?

11. a). Explain the systems of roof bolting and their applicability?

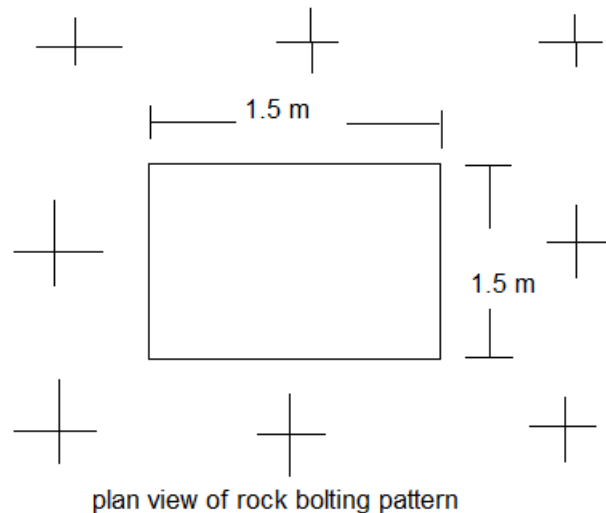
OR

- b). Write the basic principle of friction prop?

12. a). A core sample of 54 mm diameter having young's modulus of 68.97 GPa fails in uni-axial compression at 0.1 axial strain. Calculate the axial load at failure in k N?

OR

b). The bolts are spaced at 1.5 m centre-to-centre in a square pattern as shown in the figure below. The tensile stress in 22 mm diameter bolt rod is 193.35 MPa. The unit weight of the roof layer is 25 kN/m³. Calculate the axial load in the bolt rod in kN?



PART – C

Instructions:

Answer **the following** questions. Each question carries **five** marks 4 x 5 = 20 Marks

13. a) A piece of coal
sample weighs 10 kg in air and 2 kg when immersed in water. Calculate the specific gravity of the coal sample?

OR

b). The average young's modulus and poisson's ratio values of a limestone sample are 60×10³ MPa and 0.3 respectively. Calculate the shear modulus in MPa?
14. a) In a bore hole log
of 1.2 m in length ,recovery of rock cores in cm is given below
20,8,15,8,8,4,3,9,10,1,5,10 Calculate the RQD in percentage?

OR

b) Explain the method of determination of confined strength using “Tri-axial” test?
15. a) Explain the method of withdrawal of supports using Sylvester prop with drawer

OR

b) Explain the method of supporting road way junction used for transportation coal .
16. a) Explain indirect method of determination of Tensile strength of the rock specimen

Or

b). Derive the relation between Longitudinal and lateral stresses ?

18MNG-504 E [A] :MINE ENVIROMENTAL ENGINEERING

Course Title :	MINE ENVIROMENTAL ENGINEERING	Course Code	18MNG-504E[A]
Semester	V	Course Group	Elective
Teaching Scheme in Periods(L:T:P)	45:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours :	60Pds
CIE	60 Marks	SEE	40 Marks

Rationale: Mine environmental engineering is an elective subject which forms the basis for mining engineering. Stress laid down the study of mine environment which means the surrounding atmosphere present in the mines. Every mining engineer must know about working environment to carry out day to day work in safe manner. This subject serves as knowledge for further advance courses.

Pre requisites

This course requires the basic knowledge of mathematics and physical sciences and mine gases at Vth semester level

COURSE OUTCOMES

CO1 :	Employ the principles of mine environment in underground , Basic concepts of mine ventilation systems
CO2 :	Create provisions of mechanical ventilation
CO3 :	Carry out the distribution , control of mine air and analyze the quality and quantity of air
CO4 :	Identify the causes and carryout precautionary measures of mine fires and explosions.
CO5 :	Carry out the rescue and recovery operations.
CO6 :	Solve simple problems related to mine ventilation.

COURSE CONTENT :

UNIT 1 MINE ENVIROMNET AND SYSTEMS OF VENTILATION

Duration : 08 periods (L:6, T:2)

Define the term Ventilation-Purpose of Ventilation - various ventilation systems used in Mine
Classifies the systems of ventilation-Natural and Mechanical Define the term mechanical ventilation -Down cast and up cast shafts-Natural ventilation and Mechanical Ventilation-
Conditions suitable for Natural Ventilation, factors influencing the production of Natural ventilation-Definition of N.V.P and motive column and their derivations - applications -related calculations - limitations of N.V.P

UNIT 2 MECHANICAL VENTILATION

Duration : 08 periods(L:6, T:2)

Classification of Mechanical ventilation - centrifugal fan, constructional details of backward bladed fan - Principle of working of air screw fan- controlling the quantity of air delivered -laws relating to quantity water gauge -Definition of terms – Manometric efficiency, theoretical depression, effective depression, mechanical efficiency, overall efficiency -Factors for selection of mine fans.

UNIT 3 - DISTRIBUTION OF MINE AIR AND VENTILATION SURVEY

Duration : 14 periods (L:10.5, T:3.5)

Objectives of distribution and coursing the air - ventilation devices – its construction, location - application regulators- Ascensional and descensional ventilation - leakage of air, air lock,
Objectives of ventilation survey - different methods of pressure – quality - quantity surveys – precautions - accessories etc.,- kata thermometer.

UNIT 4 MINE FIRES AND EXPLOSIONS

Duration : 14 periods (L:10.5, T:3.5)

Classification, causes, preventive measure, spontaneous heating- Different methods of dealing with fire Permanent sealing of Fire. Collection of samples behind fire seals – Interpretation of samples – Coward's diagram, calculation of CO/O₂ deficiency ratios, reopening of sealed off areas. Types of mine explosions-Causes and preventive measures, coal dust explosion-causes and preventive measures-treating coal dust by watering and stone dust barriers – water barriers

UNIT5 RESCUE AND RECOVERY

Duration : 08 periods (L:6, T:2)

Rescue and recovery operations, operations in mines objectives and classification of rescue apparatus -Self contained breathing apparatus - Smoke helmet- constructional details - Gas mask

- Self rescuer - purpose of resuscitating apparatus - Rescue stations-equipment required, Rescue Organisation – Construction and function.

UNIT 6 ENGINEERING APPLICATIONS Duration : 08 periods (L:6, T:2)

Simple calculations on motive column - N.V.P - Calculations on theoretical depression - manometric efficiency - mechanical efficiency - Mine air distribution - calculations, - Grahams and willet's ratio - Simple calculation on ventilation survey - quantity and pressure.

REFERENCE BOOKS:

1. Elements of mining technology by D.J.Deshmukh Denett publications.
2. Mine disasters and mine rescue by Madiseti Anant Ramulu Oxford & IBH publishing co. Pvt.ltd.
3. Mine Ventilation by G.B.Mishra, Oxford & IBH publishing co.Pvt.ltd
4. Mine ventilation Vol. I and II by Ghatak

Suggested E-Learning references

1. www.nptel.ac.in
2. www.iitkgp.ac.in/

Specific Learning Outcomes

On completion of the study of the subject a student should be able to comprehend the following:

- 1.0 **Mine Environment and Systems of ventilation**
- 1.1 Define the term Ventilation.
- 1.2 What is the purpose of Ventilation
- 1.3 List the various ventilation systems used in Mines
- 1.4 Define the term mechanical ventilation
- 1.5 Explain the term Natural ventilation system
- 1.6 Define the terms down cast and up cast shafts with sketches
- 1.7 List the conditions suitable for N.V.
- 1.8 List the factors influencing the production of N.V.P
- 1.9 Define the term motive column

- 1.10 What is the formula to determine the height of motive column
- 1.11 Applies the formula to determine N.V.P.
- 1.12 Convert height of motive column into pressure and vice versa
- 1.13 Solve the numerical problems related to N.V.P and Motive column
- 1.14 List the Limitations of N.V.

2.0 MECHANICAL VENTILATION

- 2.1 Define the term mechanical ventilation
- 2.2 Classify the mechanical ventilation fans basing on the principle of working, location, forcing or exhausting.
- 2.3 Classify the Centrifugal fans basing on the direction of bent of blades.
- 2.4 Explain the principle of working of Centrifugal Fan with sketch.
- 2.5 Describe the constructional details of backward bladed centrifugal fan and function of each part and drive.
- 2.6 Explain the reasons for preferring backward bladed fan over others
- 2.7 List the merits and de-merits of Centre fugal Fan.
- 2.8 Explain the Principle of working of Air Screw Fan
- 2.9 Describe the Constructional Details, Functions of each part and drive of Air Screw Fan.
- 2.10 List the Methods of controlling the quantity of Air Delivered by the Fan
- 2.11 Compares Air Screw Fan with centrifugal Fan
- 2.12 Define the laws of mechanical ventilation
- 2.13 Define the terms manometric efficiency, theoretical depression, effective depression, mechanical efficiency and over-all efficiency of mine fan
- 2.14 Apply the formula for each of the above
- 2.15 Solve the numerical problems for each of the above
- 2.16 Compare between forcing vs. exhaust fans
- 2.17 List the factors for selection of fan for given mine conditions
- 2.18 List the fan laws related to pressure , quantity , power and speed

3.0 DISTRIBUTION OF MINE AIR AND VENTILATION SURVEY

- 3.1 Explain the coursing of air
- 3.2 List the ventilation devices used for coursing the air current – Brattices, stopping's, doors, regulators, air crossing.
- 3.3 Explain the effects of regulator on mine ventilation system.
- 3.4 Explain the accessional and declensional Ventilation systems.
- 3.5 List the merits and de-merits of above systems
- 3.6 List the sources and preventive measures of leakage of air in a mine.
- 3.7 Explain the purpose of air lock
- 3.8 What are the laws of mine air friction and factors influencing mine friction
- 3.9 Explain the Atkinson's equation used to determine resistance of road way
- 3.10 Define the term "Equivalent Orifice"
- 3.11 Derive the formula of equivalent orifice
- 3.12 Solves the numerical problems on the above formula
- 3.13 Describe the effects of mine air ways in series and parallel
- 3.14 Formula to calculate over all resistance when roadways are connected in series and parallel
- 3.15 Simple numerical problems when roadways are connected in series, parallel
- 3.16 Distribution of quantity of air due to splitting of roadways
- 3.17 Define the ventilation survey
- 3.18 Explain the objectives of ventilation survey
- 3.19 Explain the different methods of conducting pressure survey
- 3.20 List the precautions for accurate work
- 3.21 List and explain the objectives of quantity survey
- 3.22 List and explain the different methods of quantity survey
- 3.23 Determines the quantity of Air Flow in Mine Air Way by ventilation survey
- 3.24 Define the term Ventilation Efficiency Quotient (VEQ)
- 3.25 Explain the objects of qualitative survey
- 3.26 Define the term Kata Factor
- 3.27 Determination of cooling power of Mine Air with help of Kata Thermometer
- 4.1 Mine Fires and Explosions**
- 4.2 What are different types of fires
- 4.3 List the causes and preventive measures of Surface and underground mine fires
- 4.4 Define the term 'Spontaneous heating'
- 4.5 List the signs and factors for developing spontaneous heating.

- 4.6 List the causes and preventive measures of spontaneous heating
- 4.7 Explain the different methods of dealing with fires.
- 4.8 Explain the constructional details of preparatory, temporary and permanent stoppings.
- 4.9 Explain the procedure of permanent sealing of fire in I,II,III degree Gassy mines.
- 4.10 Explain the method of collecting samples behind the Fire Seals
- 4.11 Calculates the CO/O_2 and CO_2/O_2 deficiency ratio Interprets Coward diagram for finding the explosibility of Methane Air Mixture.
- 4.12 Explain the explosibility limits of the fire dam using Cowards diagram.
- 4.13 Explain different methods of reopening of sealed off areas
- 4.14 List different fire fighting equipment.
- 4.15 What are the different types of mine explosions.
- 4.16 List the causes and preventive measures of fire damp explosions.
- 4.17 Explain the occurrence and preventive measures of coal dust explosion.
- 4.18 What is the purpose of stone dust barriers.
- 4.19 What are the principle of stone dust barriers.
- 4.20 Illustrate the application and functions of water barriers

5.0. Rescue and Recovery

- 5.1. What are the situations requiring rescue operations
- 5.2. Give the comprehensive classification of rescue apparatus.
- 5.3. Explain the constructional details of self contained breathing apparatus(Compressed oxygen)
- 5.4. Explain the constructional details of smoke helmet.
- 5.5. Describe gas mask.
- 5.6. Describe the self rescuer.
- 5.7. What is the purpose of resuscitation apparatus.
- 5.8. What are the tests to be conducted before and after using rescue apparatus.
- 5.9. What is the purpose of rescue station.
- 5.10. List the equipment required to be kept in rescue station.
- 5.11. Explain the rescue organisation.
- 5.12. Describe the rescue operation.

6.0 Engineering Applications

- 6.1 Simple numerical calculations on motive column , NVP
- 6.2 Effects of presence of inflammable gasses, density, temperature in mines on NVP
- 6.3 Method of selection of fans under various mining conditions

- 6.4 Simple numerical fan problems related to fan laws
- 6.5 Simple numerical problems on series and parallel connection of roadways
- 6.6 Numerical problems to calculate Pressure, Quantity using Atkinson's equation and computation of cooling power by Kata thermometer
- 6.7 Application of Graham's and Willet's ratio
- 6.8 Application of sealing of mine workings and method of re-opening them
- 6.9 Application of rescue and recovery apparatus used in hazardous conditions

Course Outcome		CL	Linked PO	Teaching periods
CO1	MINE ENVIRONMENT AND SYSTEMS OF VENTILATION	R/U/A	1,2,4,5,6,7	08
CO2	MECHANICAL VENTILATION	R/U	1,2,4,5	08
CO3	DISTRIBUTION OF MINE AIR AND VENTILATION SURVEY	R/U/A	1,3,4,8,9,10	08
CO4	MINE FIRES AND EXPLOSIONS	R/U/A	2,4,6	14
CO5	RESCUE AND RECOVERY	R/U/A	2,5,8,9,10	14
CO6	ENGINEERING APPLICATIONS	U/A	4,5,8,9	08
	Total			60

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
6	VI			7,8	10(b)	14(b)	
					12(a)	16(a)	
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MID-I

Model Paper

Sub Code: 18MNG504 E[A]

Sub Name: MINE ENVIRONMENTAL ENGINEERING

Semester: V Semester

Time: 01 hour

Max Marks: 20

PART-A

1x4=4 Marks

Note: Answer All question

1. Define the term Ventilation?
2. Define the term mechanical ventilation?
3. List the Methods of controlling the quantity of Air Delivered by the Fan?
4. Define the term “Equivalent Orifice”?

PART-B

3x2=6 Marks

5. (a) List the factors influencing the production of N.V.P?
OR
(b) Define the term motive column and write its formula ?
6. (a) Define the laws of mechanical ventilation?
OR
(b) Classifies the mechanical ventilation fans basing on the principle of working, location?

PART-C

5x2=10 Marks

7. (a) In a mine the mean air temperature in D.C , shaft of 400 m deep is 28°C and in the U.C. shaft is 38°C calculate the motive column and N.V.P. assuming average barometric pressure in D.C. shaft to be 750 mm of Hg.
OR
(b)What are the factors influencing Natural Ventilation system.
8. (a) Explain the term natural ventilation and write the conditions suitable for natural Ventilation?
OR
(b) Describe the characteristic curves of backward bladed centrifugal fan.

MID-II

Model Paper

Sub Code: 18MNG504 E [A]

Sub Name: MINE ENVIRONMENTAL ENGINEERING

Semester: V Semester

Time: 01 hour

Max Marks: 20

PART-A

1x4=4 Marks

Note: Answer All question

1. List the ventilation devices?
2. List the ventilation devices used for coursing the air current?
3. Classify the mine fires?
4. Define the term 'Spontaneous heating'?

PART-B

3x2=6 Marks

5. (a) List the sources and preventive measures of leakage of air in a mine?
OR
(b) Define the term Kata Factor. List factors influencing cooling power of air?
6. (a) List the causes and preventive measures of Surface and underground mine fires?
OR
(b) List different fire fighting equipment.

PART-C

5x2=10 Marks

7. (a) Define the term Ventilation Efficiency Quotient (VEQ)?
OR
(b) State the conditions requiring the use of Booster Fan?
8. (a) What is the purpose of stone dust barriers?
OR
(b) What are the different types of mine explosions?

Semester End Examination

Model Paper

Sub Code: 18MNG504 E[A]

Sub Name: MINE ENVIRONMENTAL ENGINEERING

Semester: V Semester

Time: 02 hours

Max Marks 40

PART-A

8x1=8 Marks

Note: Answer All question

1. Differentiate centrifugal vs. axial flow fan ?
2. Write two differences between self rescuer and gas mask?
3. Explain the factors influencing Natural Ventilation Pressure?
4. List the valves used in self containing breathing apparatus ?
5. What is motive column?
6. Define the term mechanical ventilation?
7. What is the purpose of ventilation in mines?
8. List different types of Ventilation systems ?

PART-B

3x4=12

9. a) Sketch and explain any escape apparatus?

OR

- b) List the causes of spontaneous heating?

10. a) Given the area of cross section of mine road way is 6 m^2 and velocity of air passing through it is 2.6 m/sec . calculate the quantity of air passing through?

OR

- b) List the merits and demerits of Ascensional and descensional ventilation system

11 a) An underground coal mine is of degree –III gassy mine. Which type of fan is suitable, and explain its constructional details?

OR

(b) A mine road ways having $2\text{m} \times 3\text{m}$ cross sectional area , length 100m , co-efficient friction of the road way is 0.001 k.murgs Calculate Resistance of the road way and Pressure drop across the road way given quantity of air flow is $30\text{m}^3 / \text{min}$?

12. (a) Explain the factors influencing Natural Ventilation Pressure?

OR

- (b) Explain the term "Neutral line", Critical pressure related to installation of Booster fan

PART-C

5x4=20

13. (a) The quantity of air delivered by a back ward bladed fan running at a speed of 200 RPM is 50m^3 / min. If the speed of the fan is doubled calculate the percentage of increase in quantity

OR

- (b) Explain the accessional and descensional Ventilation systems with a sketch.

14. (a) Explain the constructional details of permanent stopping with a neat sketch?

OR

- (b) The resistances of a road ways connected in series R_1, R_2, R_3 are $1.5 \text{ N s}^2\text{m}^{-8}$, $2.5 \text{ N s}^2\text{m}^{-8}$ and $2.6 \text{ N s}^2\text{m}^{-8}$ respectively. Find the total resistance.

15. (a) Describe with sketch about Self rescuer ?

OR

- (b) State the methods of artificial ventilation or respiration ?

- 16 (a) Calculate CO/O_2 and CO_2/O_2 deficiency ratio and interpret the results

The percentage of gasses in the return air of a normally working mine are as follows

O_2 -----19.95 CH_4 ----- 0.93 CO ----- 0.005

N_2 ----- 78.72 CO_2 ----- 0.39

OR

- (b) A mine is subjected to firedamp explosion. Explain the method of rescue operations carried out by the rescue personnel?

18MNG-504 E [B] :METHODS OF WORKING METAL

Course Title :	METHODS OF WORKING METAL	Course Code	18MNG-504 E [B]
Semester	V	Course Group	Elective
Teaching Scheme in Periods(L:T:P)	45:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Hours :	60Pds
CIE	60 Marks	SEE	40 Marks

PRE REQUISITE : Basic understanding on Methods of Mining, applicable conditions, mine environment.

RATIONALE : Methods of working metal is a core subject most of mines are belongs to metal mining in India. Except coal and petrol mining every mine comes under the category of metal mines. Every mining engineer must know about working methods of metal to glean the major opportunities in the arena of mining. This subject serves as knowledge for further advance courses.

COURSE OUTCOMES:

CO1 :	Employ Basic concepts of metal mining
CO2 :	Classify and describe different types of underground developmental openings
CO3 :	Apply the different stoping methods suitable for different ore deposit condition
CO4 :	Analyze the environmental conditions of deep mines
CO5 :	Carry out the sampling and assaying operations.
CO6 :	Solve simple problems related to mine ventilation.

COURSE CONTENT

UNIT 1 BASIC CONCEPTS OF METAL MINING Duration : 08 periods (L:6, T:2)

Definitions of various terms used in metal mines- Mineral-Ore-Ore body-Gangue-Ore forming minerals- Rock forming minerals-Foot wall-Hanging wall- Raise- Winze-Level- Level interval- Back-terms with sketch- Crown pillar- sill pillar- Ore pass-Ore bin- Ore chute- Ore shoot- Cross-cut – Vein – Sub level – Load – Comparison between coal Mining and Metal Mining. Classification of the Non coal deposits – Classification of mineral deposits basing on depth, inclination , regularity, geometry.

UNIT 2 DEVELOPMENT OF METAL MINING METHOD

Duration :10 periods(L:7.5, T:2.5)

Drivage- purpose - methods of drivages (conventional and mechanised)- conventional methods - method of drivage of winze - application of tunnel boring -method tunnel boring - merits - demerits - conventional methods of raising(open and compartmental)- applicabilities - open raising – merits-demerits - compartmental methods of raising (two and three compartment)- applicability Sketch and explain two compartmental raising method- merits - demerits - applicability of three compartmental raising- explain - merits demerits - mechanised methods of raising- (Swedish ladder, Jora raising, Alimak climber, long hole drilling, raise boring.)- Joraraising- applicabilities - explain - merits - demerits -List the applicabilities - explain - Alimak raise climber- explanation - merits – demerits- applicabilities of Long hole raising method-reaming –methods –merits of bored raises-drop raising.

UNIT 3 STOPING METHODS Duration : 12 periods (L:9, T:3)

Classification of Stopping Methods by mode of attack, supported/Un supported and other methods Stopping- preparatory arrangements stope development - classifications of Stopping methods- factors governing the selection of stopping methods. Classification of stopping methods with respect to its attack - Breast stopping with a sketch- applicability- merits - demerits - method underhand stopping with a sketch- applicabilities - merits -demerits - limitations - method of Overhand stopping with sketch- applicabilities - limitations –merits-demerits-Comparison, Classification of stopping methods basing on the method of support used.- method Open stopes.- applicabilities-limitations - the method of Filled stopping method.- applicabilities – limitations-

Sketch and explain Cut and fill stoping - applicabilities - merits –demerits-limitations-hydraulic fill stoping-applicabilities-merits-demerits-limitations. Method of Shrinkage stoping with a sketch- applicabilities - merits –demerits-limitations- method of Sub-level stoping with a sketch- applicabilities-merits-demerits-limitations-vertical crater method-applicabilities-merits-demerits-limitations-ringholedrilling-applicabilities-merits-demerits-limitations-Squareset method- applicabilities-merit-demerits-limitations

UNIT 4 PROBLEMS IN DEEP MINES

Duration : 12 periods (L:9, T:3)

Define term deep mining – Main difficulties – strata control problems – environmental problems – pressure measuring instruments – temperature measuring instruments – sources of heat-vapour relative humidity – mixing ratio – absolute humidity – methods of measuring humidity – instruments humidity – temperature. – instruments for measuring relative humidity – density of mine air – factors which changes density of mine air – specific gravity, specific heat, enthalpy – heat and humidity on miner – heat stroke and its effects, Preventive measures – changes in Cardiac-vascular systems – changes in water and chloride metabolism – preventive measures – metal fatigue on miner – working in deep mines – fall of efficiency of miner in hot and humid deep mines – cooling power of mine air – instruments for measuring cooling power of mine air- methods that improve the cooling power of mine air.

UNIT 5 SAMPLING METHODS

Duration : 10 periods (L:7.5, T:2.5)

Term sampling – objectives of sampling – general principle-Mining situations – classification – channel sampling – applicabilities – personnel required – Equipment required - chip sampling- applicabilities – Bulk sampling – applicabilities – Drill sampling – churn drill sampling- rock drill sampling- core drill sampling- Radio metric sampling – Stope sampling – Conveyor sampling- wagon sampling – truck sampling- technique of coning and quartering with sketch- purpose –application- salting- preventive measures – Assaying- Assay value- Assay value – Assay plan- Assay average- objectives of Assay plans – shown on assay plans- formula to compute Assay values – solution of simple problems on Assay values.

UNIT 6 ENGINEERING APPLICATIONS

Duration : 08 periods (L:6, T:2)

Development of mineral deposits - Application of stopping methods –Analysis of deep mine problems - Sampling techniques -under given geological parameters

SUGGESTED BOOKS :

- 1) Elements of mining Vol 2 : D.J.DESHMUKH
- 2) Mine Ventilation : G.B.Mishra
- 3) Study of metal mining methods : CHACHARKAR

REFERENCE BOOKS :

- 1) Introductory mining engineering : L.HARTMAN
- 2) Mining Engineers Hand Book : Peele. Vol 1,2
- 3) Mining Geology : AROGYA SWAMI
- 4) Introductory Mining Engineering : Hartman, H.L.
- 5) Underground Mining Methods : Hustrulid

Specific Learning Outcomes

On completion of the study of the subject a student should be able to comprehend the following:

OBJECTIVES

1.0 Basic concepts of metal mining

- 1.1 WHAT IS THE SIGNIFICANCE OF METAL MINES IN INDIA.
- 1.2 LIST THE DIFFERENT METAL MINES IN INDIA AND WORLD.
- 1.3 EXPLAIN OCCURRENCE AND DISTRIBUTION OF DIFFERENT METALS IN INDIA.
- 1.4 LIST DIFFERENT METAL MINING BASED INDUSTRIES IN INDIA.
- 1.5 DEFINITIONS OF THE FOLLOWING TERMS
A) MINERAL B) ORE C) ORE BODY D) GANGUE
E) ORE FORMING MINERALS F) ROCK FORMING MINERALS
- 1.6 DEFINE THE TERMS WITH SKETCH A) FOOT WALL B) HANGING WALL C) BACK
- 1.7 DEFINE THE TERMS WITH SKETCH A) CROSS-CUT B) VEIN D) LOAD
- 1.8 Define the terms with sketch a) Ore pass b) Ore bin c) Ore chute d) Ore shoot
- 1.9 Define the terms with sketch a) Foot wall b) Hanging wall c) Raise d) Winze
E) LEVEL F) LEVEL INTERVAL G) SUB LEVEL

- 1.10 DEFINE THE TERMS WITH SKETCH A) CROWN PILLAR B) SILL PILLAR D) FINGER RAISE
- 1.11 COMPARE COAL MINING AND METAL MINING.
- 1.12 CLASSIFY THE NON COAL DEPOSITS.
- 1.13 CLASSIFICATION OF MINERAL DEPOSITS BASING ON DEPTH, INCLINATION, REGULARITY, GEOMETRY.
- 1.14 Explain the factors considered for selection of level intervals.
- 1.15 Define the term shaft station.
- 1.16 What is the purposes of shaft stations.
- 1.17 List the factors for determining the size of the shaft station.
- 1.18 Illustrates the shaft station through sketch.
- 1.19 Mention the purposes of ore pass
- 1.20 Sketch and explain the ore pass
- 1.21 What is the purposes of ore bin.
- 1.22 Sketch and explain the ore bins.
- 2.0 Development of metal mining methods**
- 2.1 Define the term drivage
- 2.2 Mention the purpose of drivages
- 2.3 Explain the method of drivage of winze with sketch
- 2.4 Mention the application of tunnel boring method
- 2.5 Explain the method of drivage with tunnel boring machine (TBM)
- 2. 6 List the merits of tunnel boring method
- 2. 7 List the demerits of tunnel boring method
- 2. 8 Classify the Raising method.
- 2. 9 Classification of raising methods.
- 2. 10 List the applicability of Jora raise method
- 2. 11 Sketch and explain Jora raise method.
- 2. 12 List the merits of Jora raise method
- 2. 13 List the demerits of Jora raise method
- 2. 14 List the applicability of Alimak raise climber
- 2. 15 Sketch and explain the method of alimak raising method
- 2. 16 What are the merits of Alimak raise climber
- 2. 17 What are the demerits of Alimak raise Climber
- 2. 18 List the applicability of Long hole raising method

- 2. 19 Sketch and explain the long hole raising
- 2. 20 List the merits of long hole raising
- 2. 21 List the demerits of long hole raising
- 2. 22 List the applicability of (reaming) raise boring
- 2. 23 Define the term down reaming with sketch
- 2. 24 Define the term up reaming with sketch.
- 2. 25 List the merits of bored raises
- 2. 26 Define the term drop raising.

3.0 **Stoping methods**

- 3. 1 Define the following terms a) stope b) stoping
- 3.2 What are the preparatory arrangements for commencement of stope development
- 3.3 Give the classification of Stoping methods.
- 3.4 List factors governing selection of stopping methods
- 3.5 Explain the methods of open stopes.
- 3.6 Explain the method of Breast stoping with a sketch.
- 3.7 Mentions applicability of Breast stoping.
- 3.8 List the merits and demerits of Breast stoping
- 3.9 Explain the method underhand stopping systems with a sketch.
- 3.10 Mentions the applicability of underhand stoping.
- 3.11 List the merits and demerits of Underhand stoping
- 3.12 Explain the method of overhand stoping with sketch.
- 3.13 Mentions the applicability of overhand stoping.
- 3.14 List the merits and demerits of Overhand stoping
- 3.15 Compare Under hand stoping with Overhand stoping method.
- 3.16 Sketch and explain Cut and fill stoping
- 3.17 List the applicability of Cut and fill method of stoping
- 3.18 List the merits and demerits of Cut and fill stoping method
- 3.19 Explain the method of Shrinkage stoping with a sketch
- 3.20 List the applicability of Shrinkage stoping.
- 3.21 List the merits and demerits of Shrinkage stoping
- 3.22 List the limitations of Shrinkages stoping.
- 3.23 Explain the method of Sub-level stoping with a sketch.

- 3.24 List the applicability of Sub-level stoping.
- 3.25 What are the merits and demerits of Sublevel stoping
- 3.26 Explain the method of Vertical crater retreating method with sketch.
- 3.27 List the applicability of Vertical crater retreating method.
- 3.28 List the merits and demerits of Vertical crater mining
- 3.29 Sketch and explain Square- set timbered stoping
- 3.30 List the merits and demerits of Square-set timbered stoping
- 3.31 List the applicability of Square-set timbered stoping
- 4.0 **Problems associated with deep mining**
- 4.1 Define the term Deep mining.
- 4.2 List the main difficulties associated with deep mining (Strata Control and Environment)
- 4.3 List the pressure measuring instruments in deep mines
- 4.4 List the temperature measuring instruments in deep mines
- 4.5 List the sources of heat in mine air
- 4.6 Define the terms vapor pressure, saturation deficit, relative humidity, dew point, Specific humidity, mixing ratio, absolute humidity.
- 4.7 List the methods of measurement of humidity
- 4.8 List the instruments for measuring relative humidity of mine air in deep mines
- 4.9 Define the term density of mine air
- 4.10 List the factors which changes density of mine air
- 4.11 Define the term Specific gravity, specific heat and enthalpy
- 4.12 Explain the adverse effects of heat and humidity on miner
- 4.13 Explain heat stroke and its effects, Preventive measures in deep mines
- 4.14 Explain the changes in Cardiac-vascular systems on miner its effects, preventive measures
- 4.15 Explain the changes in water and chloride metabolism on miner its effects and preventive measures working in deep mines
- 4.16 Explain metal fatigue on miner working in deep mines
- 4.17 Explain the fall of efficiency of miner working in hot and humid deep mines
- 4.18 Define the term cooling power of mine air
- 4.19 List the instruments for measuring cooling power of mine air
- 4.20 List the methods that improve the cooling power of mine air in deep mines
- 5.0 **Sampling methods**
- 5.1. Define the term sampling

- 5.2. List the objectives of sampling
- 5.3. Explain the general principle of sampling
- 5.4. List the mining situations under which sampling is employed
- 5.5. Classify sampling methods basing on method of collections. Channel sampling, Chip sampling, Bulk sampling
- 5.6. Explain channel sampling
- 5.7. List the applicablities of channel sampling
- 5.8. Name the equipment required for collection of channel sampling
- 5.9. Explain chip sampling
- 5.10. Give the applicablities of chip sampling
- 5.11. Explain bulk sampling
- 5.12. What are the applicablities of bulk sampling
- 5.13. List drill sampling methods
- 5.14. Define churn drilling
- 5.15. Define rock drill sampling
- 5.16. Define core drill sampling
- 5.17. Define radio metric sampling
- 5.18. Define the term stope sampling, conveyor sampling, wagon sampling and truck sampling.
- 5.19. Explain the technique of coning and quartering with a sketch
- 5.20. What is the purpose of coning and quartering
- 5.21. Explain the term salting
- 5.22. List the preventive measures of salting
- 5.23. Define the term Assaying
- 5.24. Define the term Assaying plans
- 5.25. List the details are to be shown on Assay plans
- 5.26. Mention the formula to compute Assay values by area of influence method
- 5.27. Solve simple problems on Assay values

6.0 Engineering Applications

- 6.1 Development of ore deposits based on the given geological parameters
- 6.2 Application of different stopping methods based on given geological parameters
- 6.3 Know the environmental conditions of deep mines
- 6.4 Application of the sampling methods
- 6.5 Simple numerical problems on computation of a) Average grade b) Average width etc

CO-PO MAPPING MATRIX

Course Outcome		CL	Linked PO	Teaching periods
CO1	Employ Basic concepts of metal mining	R/U/A	1,2,6	08
CO2	Classify and describe different types of underground developmental openings	R/U	1,2,4,5	10
CO3	Apply the different stoping methods suitable for different ore deposit condition	R/U/A	2,3,4,8,9,10	12
CO4	Analyze the environmental conditions of deep mines	R/U/A	2,3,4,6	12
CO5	Carry out the sampling and assaying operations.	R/U/A	2,5,8,9,10	10
CO6	Solve simple problems related to mine ventilation.	U/A	4,5,	08
	Total			60

BOARD DIPLOMA EXAMINATIONS (C-18)
MID PAPER-I

D.MNG.E –V -SEMESTER

18MNG-504 E[B] ::METHODS OF WORKING METAL

Duration : 1 Hours

Maximum Marks: 20

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark. 4 X 1 = 4 marks

1. Define the term shaft station?
2. Define the term drivage?
3. Define the term drop raising?
4. Classify the Raising method.?

PART – B

Instructions: Answer **the following** questions. Each question carries **three** marks

2 x 3 =6 Marks

- 5.a. Define the terms with sketch i) Crown pillar ii) sill pillar ?

Or

- b. Explain the factors considered for selection of level intervals.?

- 6.a. Define the term drop raising. ?

Or

- b. List the merits of long hole raising?

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks

2 x 5 =10 Marks

- 7 a. Sketch and explain the ore bins.?

or

- b .Classification of mineral deposits basing on depth, inclination, regularity, geometry?*

8.a. Sketch and explain the method of alimak raising method?

or

b. Explain the method of drivage with tunnel boring machine (TBM) ?

**BOARD DIPLOMA EXAMINATIONS (C-18)
MID PAPER-II**

D.MNG.E –V -SEMESTER

18MNG-504 E[B] ::METHODS OF WORKING METAL

Duration : 1 Hours

Maximum Marks: 20

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark. 4 X 1 = 4 marks

1. Define the term stope?
2. List factors governing selection of stopping methods?
3. Define the term Deep mining.?
4. List the pressure measuring instruments in deep mines

PART – B

Instructions: Answer **the following** questions. Each question carries **three** marks

2 x 3 =6 Marks

5.a List the applicability of Shrinkage stoping.?

Or

b. Mentions the applicability of underhand stoping.?

6.a List the main difficulties associated with deep mining?

Or

b. List the sources of heat in mine air?

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks

2 x 5 =10 Marks

7a. Sketch and explain Square- set timbered stoping?

or

b Explain the method of Vertical crater retreating method with sketch?

8.a. Explain the adverse effects of heat and humidity on miner?

or

b. Explain the fall of efficiency of miner working in hot and humid deep mines ?

MODEL QUESTION PAPER

BOARD DIPLOMA END-SEMESTER EXAMINATIONS (C-18)

D.MNG.E V -SEMESTER

18MNG-504 E [B] :METHODS OF WORKING METAL

Duration: 2 Hours

Maximum Marks: 40

PART-A

Instructions: (1) Answer all questions.

(2) Each question carries one marks.

1x 8 = 8 Marks

1. Name any four metal mining based industries in India
2. Classify the raising methods
3. Define the term stope
4. List the sources of heat in mine air
5. What is salting
6. Define the term sampling
7. List the equipment required for sampling.
8. Define the term Assaying

PART-B

3 x 4 = 12 Marks

Instructions: (1) Answer any four questions.

(2) Each question carries five marks.

9 (a) Compare coal mining vs. metal mining?

or

(b) Sketch and explain the jora raise method?

10 (a). Explain the method of breast stoping with a sketch.

or

(b) Explain heat stroke and its effects.

11 (a) What are the conditions required to adapt channel sample

or

(b) What are the limitations of shrinkage stoping

12 (a) Explain the method of drivage with tunnel boring machine

Or

(b) Explain various applications of stoping methods with reference to zinc mine

PART-C

5x4=20 Marks

13.(a) Explain why development of metal mine is being carried out in sill pillar?

OR

(b) Explain chip sampling method along with its applicabilites?

14.(a) Explain the cut and fill method of stoping?

OR

(b) Explain the heat and humidity problems in deep mines?

15.(a) List various methods of sampling . What are the causes of salting?

OR

(b) Explain the method of preparation sample by coning and quartering method?

16.(a) Explain the formula to compute Average grade and average width of the sample?

OR

(b) Explain the method of stoping given the following conditions

Hanging wall --- Strong

Foot wall --- Strong

Inclination -- Steeply inclined

Assume your own conditions if required.

18MNG-504E: [C] MINERAL PROCESSING

Course Title :	MINERAL PROCESSING	Course Code	18MNG-504E [C]
Semester	V	Course Group	Elective
Teaching Scheme in Periods(L:T:P)	45:15:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Periods :	60Pds
CIE	60 Marks	SEE	40 Marks

PREREQUISITES :

Basic knowledge Mineral Dressing and Tailing Management in mines

COURSE OUTCOMES :

CO1 :	Analyze the of Mineral Industry in National Economy
CO2 :	Make use of Mineral Processing Methods.
CO3 :	Demonstrate the Sequence of Operational techniques- Comminution; different types of Crushers and their operational methods
CO4 :	Classify the different types of Sizing in Mineral Processing.
CO5 :	Distinguish the different concentration Techniques.

CO6 :	Organize the Tailing in mines.
--------------	--------------------------------

COURSE CONTENT

UNIT 1 :MINERAL INDUSTRY AND ITS ROLE IN NATIONAL ECONOMY

Duration : 08 periods

Minerals and its role in National Economy, National Mineral Policy, Conservation and Substitution of Minerals.

UNIT-2: MINERAL PROCESSING - SCOPE AND OBJECTIVE Duration10 Periods

Introduction, Definition, Scope and Objectives, Definition of Feed and Flow Sheet.
Flow Sheets of Hematite, Coal and Gold . Sequence of Operation: Communiton, Sizing, Concentration .

UNIT 3: SEQUENCE OF OPERATION- COMMUNITON AND TYPES OF CRUSHERS

Duration : 12 periods

Definition, Classification of Crushers -Primary, Secondary and Teritiary Crushers.
Explanation of each type of Crusher with neat sketches, Comparison of each type Crushers.

UNIT 4 : SIZING-TYPES OF SCREENS AND TROMMELS Duration : 10 periods

Explain different types of Screens and classifiers. Stationary and Moving screens. Trommels and Grizzlies

UNIT 5: CONCENTRATION METHODS Duration : 10 Periods

Different Concentration techniques/methods- Gravity, Magnetic separation, Electrostatic Separation, Amalgamation, Froth flotation.

UNIT 6: TAILING MANAGEMENT IN MINES Duration : 10 Periods

Introduction, Definition ,Tailing Characteristics, How are waste materials managed at mine sites
Types of mine waste, Environmental impacts of mine waste, Management of mine wastes, Tailings management , Turning mine wastes into a resource.

SPECIFIC LEARNING OUTCOMES

On completion of the study of the subject a student should be able to the following:

1.0 MINERAL INDUSTRY AND ITS ROLE IN NATIONAL ECONOMY

- 1.1 List the Mining role in the Economy
- 1.0 List the Minerals and its role in National Economy
- 1.1 Define the term National Mineral Policy.
- 1.2 List the Economic benefits generated by mining
- 1.3 List the Components of mining production value
- 1.4 List the basic objective(vision) of National Mineral Policy
- 1.5 Explain the Conservation of Minerals
- 1.6 Explain about the Substitution of Minerals
- 1.7 What are the features of the New Mineral Policy

2.0 MINERAL PROCESSING - SCOPE AND OBJECTIVE

- 2.1 Define the term ore dressing / Mineral Processing
- 2.2 List the scope of Mineral Processing
- 2.3 What is basic objective of Mineral Processing
- 2.4 List the important operation of Ore dressing
- 2.5. List the advantages of Mineral Processing
- 2.5 Define the term Feed
- 2.6 Define the term Flow Sheet
- 2.7 Explain the flow sheets of Hematite
- 2.8 Explain the flow sheets of Coal
- 2.9 Explain the flow sheets of Gold
- 2.10 List the Sequence of Operation for Ore/Mineral Dressing
- 2.10 Define the term Communiton
- 2.11 Define the term Sizing
- 2.12 Define the term Concentration

3.0 SEQUENCE OF OPERATION- COMMUNITON AND TYPES OF CRUSHERS

- 3.1 List the Objective of Comminution
- 3.2 List the Purpose of Comminution
- 3.3 Classify the Comminution Process

- 3.4 List the Law of Comminution Process
- 3.5 Define the terms Sorting
- 3.6 Classify the Sorting
- 3.7 Define the term Hand Sorting
- 3.8 Define the term Mechanical sorting
- 3.9 Define the term Liberation?
- 3.10 Explain the Principles of Crushing
- 3.11 Classify the Crushing Operation
- 3.12 List the Type of Crusher
- 3.13 Explain about jaw crusher
- 3.14 Explain about Gyratory crusher
- 3.15 Explain the Working principles and Operation of Blake Jaw Crusher
- 3.16 Explain the Working principles and Operation of Dodge Jaw Crusher
- 3.17 Explain the Working Principles and Operation of Roll Crusher
- 3.18 Define the term Grinding
- 3.19 List the types of Grinding Mills
- 3.20 Explain about Tumbling Mills
- 3.21 Explain the working Principle of Rod Mills
- 3.22 Explain the working Principle of Ball mills

4.0 SIZING-TYPES OF SCREENS AND TROMMELS

- 4.1 List the Importance of sizing?
- 4.2 List the size of Methods?
- 4.3 List the designating the Mesh numbers as per ISI
- 4.4 Define Mesh Number and Mesh Size
- 4.5 Define Screening and Classifiers
- 4.6 List the types of Industrial Screens
- 4.7 List the types of Classifiers?
- 4.8 Differentiate the stationary and Movable screen
- 4.9 What is a trammel screener
- 4.10 What is a grizzly Screen
- 4.11 Explain the Wet Classification
- 4.12 Explain the Mechanical classifiers

- 4.13 Explain the Spiral Classifiers
- 4.14 Explain the Hydraulic classifier
- 4.15 Explain the Hydro cyclone classifiers
- 4.16 Explain the Centrifugal classifiers

5.0 CONCENTRATION METHODS

- 5.1 Define Concentration
- 5.2 List the objectives of Concentrating
- 5.3 Explain the Principles of Concentration
- 5.4 Define the terms Concentrate, Tailing, and Middling
- 5.5 Classify the Concentration Operations
- 5.6 Discuss the Working principle of Magnetic Separator
- 5.7 Explain the Working Principle of DMS
- 5.8 Explain the Working Principle of Jigging
- 5.9 Explain the High Tension Separators
- 5.10 List the Gravity Concentration Processes
- 5.11 Define the Sink and Float Technique
- 5.12 Describe the Working Principle of Tabling
- 5.13 Define the Froth flotation
- 5.14 Explain the Froth flotation Technique

6.0 TAILING MANAGEMENT IN MINES

- 6.1 Define the term Mine Tailing
- 6.2 List the Tailing Characteristics
- 6.3 Explain the waste materials managed at mine sites
- 6.4 List the Types of mine waste
- 6.5 List the Environmental impacts of Mine waste
- 6.6 Explain the Management of Mine wastes
- 6.7 Explain the tailings Management
- 6.8 Explain the techniques for Turning Mine wastes into a resources

SUGGESTED STUDENT ACTIVITIES

- 1 Student visits Library/ E-Library to refer to Mineral Processing books, video, Ppts and Lecturers.
- 2 Student inspects the available equipment in the Lab to identify Different Crushers/grinding mills/sieves /classifiers etc.,
- 3 Visit near by Coal/Metal Mining Industries to familiarize with Coal washers/Mineral Processing Techniques.
- 4 Quiz.
- 5 Group discussion.
- 6 Surprise test.

Suggested E-Learning References:

- 1.<http://www.miningmagazine.com/>
- 2.<http://www.mining-journal.com/country/India>
- 3.<http://www.cmpdi.co.in/publication.php>
- 4.www.novamining.com/knowledgebase/mineral-processing/classif
5. www.nptel.ac.in

ESSENTIAL READING

1. Principles of Mineral Dressing ----- A.M. Gaudin.
2. Mineral processing technology ---B.A. Wills (Eighth edition.)
3. Introduction of Mineral Processing : S.Mallishwararao

REFERENCE BOOKS/ SUPPLEMENTARY READINGS

1. Operational Hand Book of Mineral Processing – Vedula V RamanaMurty
2. Hand book of Mineral Dressing –H.G. Vijayendra.
3. Ore Processing----S.K. Jain.

CO PO Mapping Matrix

On Successful completion of the course, the student will be able to attain the following Course Outcomes (COs):

Course Outcome		CL	Linked PO	Teaching Periods
CO1:	Examine the importance of Mineral Industry in National Economy	R/U	1,5,6,7	08
CO2:	Explain the importance of Mineral Processing Methods.	R/U	1,2,4,10	10
CO3:	To Identify the Sequence of Operational techniques-Comminution; different types of Crushers and their operational methods	R/U/A	1,2,4,10	12
CO4:	To Classify the different types of Sizing in Mineral Processing	R/U/A	1,2,4,10	10
CO5:	Identify the different concentration Techniques.	R/U/A	1,2,4,10	10
CO6:	Organize the Tailing in mines.	R/U/A	1,2,4,10	10

**SCHEME OF EVALUATION
MID SEM-I EXAM**

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks
		R		U	A	
1	I	4	1	9(a)	13(a)	
2	II		2	10(a)	14(a)	
3	III					

4	IV					
5	V		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)
6	VI			7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)
Total Questions			8		8	8

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MODEL QUESTION PAPER

V -SEMESTER, MIDSEM – I

MINERAL PROCESSING

Sub. Code: 18MNG-504 E[C]

Time: 1 Hour

Max. Marks : 20

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark.

4 X 1 = 4 marks

1. List the Mining role in the Economy ?
2. Define the term National Mineral Policy.?
3. Define the term ORE DRESSING /MINERAL PROCESSING?
4. List the scope of Mineral Processing?

PART – B

Instructions:

Answer **the following** questions. Each question carries **three** marks

2 x 3 =6 Marks

5. a) List the Minerals and its role in National Economy?

OR

- b) List the Economic benefits generated by mining?

6. a) List the Objective of Comminution?
OR

b) Define the terms Sorting?

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks 2 x 5 =10 Marks

7 a) Explain about the Substitution of Minerals?

OR

b) Explain the Conservation of Minerals?

8. a) What is basic objective of Mineral Processing ?

OR

b) List the Sequence of Operation for Ore/Mineral Dressing?

V SEMESTER,

MIDSEM – II

Subject Name : MINERAL PROCESSING

Sub. Code: 18MNG-504E[C]

Time: 1 Hour

Max.Marks : 20

PART – A

Instructions: i. Answer **all** questions. Each question carries **one** mark. 4 X 1 = 4 marks

1. List the Objective of Comminution ?
2. List the Purpose of Comminution?
3. List the Importance of sizing??
4. List the size of Methods?

PART – B

Instructions: Answer **the following** questions. Each question carries **three** marks

2 x 3 =6 Marks

4. a. Classify the Comminution Process?

OR

- b. List the Law of Comminution Process?

5. a. Explain the Centrifugal classifiers?

OR

b. Explain the Hydro cyclone classifiers?

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks

2 x 5 =10 Marks

7 a. List the designating the Mesh numbers as per ISI?

OR

b Define Screening and Classifiers?

8. a. Explain the Hydraulic classifier ?

OR

b. Explain the Mechanical classifiers?

C-18MNG18MNG-504 E[C]

MODEL PAPER

BOARD DIPLOMA EXAMINATION, (C-18)

V SEMESTER END SEMESTER EXAMINATION

MINERAL PROCESSING

Time: 2 Hours

Max.Marks: 40

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark. 8 x 1 = 8 Marks

1. Define the term Flow Sheet?
2. What is a trammel screener?
3. List the types of Grinding Mills?
4. List the types of Classifiers?
5. Define Concentration?
6. List the objectives of Concentrating?
7. List the Tailing Characteristics?
8. List the Types of mine waste?

PART – B

Instructions: Answer **the following** questions.

4 x 3 =12 Marks

9. a. Explain the flow sheets of Coal?

OR

b. Describe the Working Principle of Tabling?

10. a. Explain the working Principle of Ball mills?

OR

b. List the Types of mine waste?

11. a. Discuss the Working principle of Magnetic Separator?

OR

b. Explain the Working Principle of DMS?

12. a. List the Tailing Characteristics?

OR

b. Explain the waste materials managed at mine sites?

PART – C

Instructions:

Answer **the following** questions. Each question carries **five** marks

4 x 5 =20 Marks

13a. Explain the flow sheets of Hematite?

OR

b. Explain the Working Principle of Jigging?

14 a. Explain the Wet Classification?

OR

b. Explain the techniques for Turning Mine wastes into a resources?

15a. Explain the Working Principle of Jigging?

OR

b. Explain the High Tension Separators?

16 a. Explain the waste materials managed at mine sites?

OR

b. Explain the tailings Management?

18MNG-505E (A): MINE LEGISLATION

Course Title :	MINE LEGISLATION	Course Code	18MNG-505E(A)
Semester	V	Course Group	Elective
Teaching Scheme in Periods(L:T:P)	45:15:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods :	60
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the general knowledge of mining operations.

Course Outcomes

After completion of the course, the student should be able to

CO1	Acquiring a knowledge on statutory provisions relating to health and safety of
-----	--

	persons employed in mines.
CO2	Apply statutory knowledge to improve welfare of persons employed in mines
CO3	Learn about qualification ,practical experience, duties and responsibilities of mine officials
CO4	Provides knowledge of establishment and location of rescue station, room and conduct of rescue work in mines when emergency exist.
CO5	Learn basic terminology and practical experience ,duties and responsibilities of various designated persons in mines.
CO6	Apply the statutory provisions to improve safety in mines

COURSE CONTENT:

UNIT 1: Mines act-1952

Duration: 09 periods (L: 6.5-T: 2.5)

Definitions of adult, employed, relay and shift, open cast working, qualified medical practitioner, reportable injury, serious bodily injury- situations under which act does not apply- Committee – Notice of Accident – Provisions of Mines Act in respect of Hour and limitations of Employment - Leave with wages –regulations, rules, bye laws.

UNIT 2: MINES RULES -1955

Duration: 10 periods (L: 7.5- T: 2.5)

Mine Rules related to definitions of court of inquiry, manager, certifying surgeon, ordinarily employed, calendar year - medical examination – workmen inspector – pit safety committee – first aid – canteen – welfare officer.

UNIT 3: METALIFFEROUS MINES REGULATIONS – 1961

Duration: 08 periods (L: 6-T: 2)

Banks man , blaster, Bellman, Landing, Material, Metalliferous mine, mining mate, official, permitted explosive, Socket – practical experience for managers, mate's and blaster's examinations – suspension or cancellation of statutory certificate – appointment of assistant managers or underground managers – duties of persons employed in mines – duties and responsibilities of mining mates - Provisions of ladder ways.

UNIT 4: MINE RESCUE RULES-1985 Duration: 06 periods (L: 4.5- T: 1.5)

Terminology of below ground mine, inspector, principal official, qualified medical practitioner, rescue trained person – establishment and locations of rescue station, rooms – functions of rescue

station, room – qualifications and experience of superintendent, instructors, room in charge – appointment of rescue trained person in mines – selection of persons for training in rescue.

UNIT 5: COAL MINES REGULATIONS (2017)-I

Duration: 13 periods (L: 9.5-T: 3.5)

Definitions – abandoned working, approved safety lamp, competent person, discontinued working, disused working, face, – board of mining examination – qualification and appointment of manager, ventilation officer, safety officer – age limit and general qualifications of candidates - duties of competent person, managers, safety officer, Overman, support man, attendant of main mechanical ventilator – haulage road ways – travelling road ways – general requirements about mine planes – types of planes – Fencings and gates..

UNIT 6: COAL MINES REGULATIONS (2017)-II

Duration: 14 periods (L: 10- T: 4)

Definition of haul road, quarter, ventilation district, working, working place, fiery seam, general body of air - mechanical Open cast workings – development work – depillaring operations – multi section and contiguous working – strata control and monitoring plan - Setting of supports – steep working - intentional flooding – Standard of ventilation – storage of explosives – magazines, stores and premises to store explosives – drilling charging stemming and firing of shot holes – misfires – duties of shot firer at the end of his shift – notice of intention or proposal of exploration for methane – protective foot wear – helmet – man power distribution plan.

REFERENCE BOOKS:

1. The mines act – 1952 (lovely prakashan publishers)
2. The mines rules – 1955 (lovely prakashan publishers)
3. The metalliferous mines regulations - 1961(lovely prakashan publishers)
4. The mine rescue rules – 1985 (lovely prakashan publishers)
5. Coal mines regulations – 2017 (lovely prakashan publishers)
6. D.G.M.S. Circulars

Unit wise Outcomes:

On completion of the study of the subject a student should be able to comprehend the following:

1.0 Understand and implement the statutory laws in mine workings to improve safety and health of persons employed in mines.

- 1.1 Define the term Adult, employed, Relay and Shift, Serious bodily injury, reportable injury, Qualified Medical Practitioner, opencast working.
- 1.2 List the provisions related to act not to apply in certain cases.
- 1.3 List the provisions related to committee constituted under section 12.
- 1.4 List the provisions of Act in respect of notice to be given about accidents.
- 1.5 List the provisions related to hours of work below ground and above ground.
- 1.6 List the provisions related to annual leave with wages.
- 1.7 State the bye – laws in mines act-1952.
- 1.8 State the provisions related to prior publications of regulations and rules.
- 1.9 List the provisions of powers to make regulations without previous publication.

2.0 Understand the mines rules-1955.

- 2.1 Define the terms, leave, calendar year, certifying surgeon, court of enquiry, ordinarily employed, and manager.
- 2.2 State the provisions related to medical examination (IME or PME) of persons employed.
- 2.3 State the provisions related to constitution of appellate medical board.
- 2.4 List the provisions of appointment of workmen's inspector.
- 2.4 List the duties of workmen's inspector as per mine rules-1955.
- 2.5 State the provisions related to composition and functions of pit safety committee.
- 2.6 State the rules related to quantity of drinking water.
- 2.7 List the provisions of canteen as per mine rules-1955.
- 2.8 List the provisions of canteen managing committee.
- 2.9 List the provisions of duties and appointment of welfare officer.
- 2.10 List the provisions of first aid station as per mines rules-1955.

3.0 Understand the statutory provisions of MMR-1961.

- 3.1 Definitions:-Banks man, Blaster, Bellman, Landing, Metalliferous mine, Socket, Mining mate, Official, Permitted explosive.
- 3.2 State the provisions of practical experience of candidates for manager's examination as per MMR-1961.
- 3.3 State the provisions of practical experience of candidates for Mate's and Blaster's examinations as per MMR-1961.

- 3.4 List the provisions related to appointment of assistant managers or underground managers as per MMR-1961.
- 3.5 List the duties of persons employed in mines as per MMR-1961.
- 3.6 List the duties and responsibilities of mining mates as per MMR-1961.
- 3.7 State the provisions of ladders and ladder ways as per MMR-1961.

4.0 Understand the importance of rescue rules in underground mines.

- 4.1 Definitions: Below ground mines, Inspector, Principal official, Qualified medical practitioner, Rescue trained person.
- 4.2 List the provisions of establishment and locations of rescue station.
- 4.3 List the provisions of establishment and locations of rescue room.
- 4.4 List the provisions related to functions of rescue station.
- 4.5 List the provisions related to functions of rescue room.
- 4.6 List the qualifications and experience of superintendent.
- 4.7 List the qualifications and experience of instructors.
- 4.8 List the qualifications and experience of room in charge.
- 4.9 State the provisions related to appointment of rescue trained persons in mines.
- 4.10 State the provisions related to selection of persons for training in rescue.

5.0 Know the statutory provisions to improve the safety and health in coal mines.

- 5.1 Define the terms: Abandoned working, Approved safety lamp, Competent person, Discontinued working, Disused working, Face.
- 5.2 State the provisions related to age limit and general qualifications of candidates as per CMR-2017.
- 5.3 List the provisions related to board of mining examinations.
- 5.4 List the provisions related to qualification and appointment of managers as per CMR-2017.
- 5.5 List the provisions related to qualification and appointment of Ventilation officer as per CMR-2017.
- 5.6 List the provisions related to qualification and appointment of Safety officer as per CMR-2017.
- 5.7 List the duties of competent person.
- 5.8 List the duties and responsibilities of manager as per CMR-2017.
- 5.9 List the duties and responsibilities of Safety Officer.

- 5.10 List the duties and responsibilities of Over man.
- 5.11 List the duties of support man.
- 5.12 List the duties of attendant of main mechanical ventilator.
- 5.13 List the provisions related to Haulage roads.
- 5.14 List the provisions related to travelling roadways.
- 5.15 State the provisions of general requirements about mine planes.
- 5.16 State the provisions related to types of plans as per CMR-2017.
- 5.17 List the provisions related to Fencings and gates.
- 6.0 Know the statutory provisions to improve the safety and health in coal mines.**
- 6.1 Define the terms: Haul road, Quarter, Ventilation district, Working, Working Place, fiery seam, general body of air.
- 6.1 List the provisions related to mechanised Opencast working.
- 6.2 List the provisions related to Development work as per CMR-2017.
- 6.3 List the provisions related to Depillaring operations.
- 6.4 State the provisions related to Multi-section and Contiguous working.
- 6.5 State the provisions related to strata control and monitoring plan.
- 6.6 List the provisions related to setting of supports as per CMR-2017.
- 6.7 List the provisions related to steep working.
- 6.8 List the provisions related to intentional flooding.
- 6.9 List the provisions related to standard of Ventilation as per CMR-2017.
- 6.10 List the provisions related to storage of Explosives.
- 6.11 List the provisions related to Magazines, stores and premises to store explosives.
- 6.12 List the provisions related to Drilling, charging, stemming and firing of shot holes.
- 6.13 List the provisions related to Misfires as per CMR-2017.
- 6.14 State the provisions related to Duties of shot firer at the end of his shift.
- 6.15 State the provisions related to Notice of intention or proposal of exploration for methane.
- 6.16 List the provisions related to use, supply and maintenance of protective foot wear.
- 6.17 List the provisions related to use and supply of helmet.
- 6.18 State the provisions related to man power distribution plan.

Suggested Student Activities

1. Student visits Library to refer various countries mining laws books
2. Follow DGMS circulars and government gazettes.
3. Follow the various committee reports regarding mining activities.
4. Quiz.
5. Group discussion.
6. Surprise test.

Suggested E-Learning references

1. ibm.nic.in
2. www.dgms.gov.in
3. www.nptel.ac.in

CO-PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching periods
CO1	Acquiring the knowledge on statutory provisions relating to health and safety of persons employed in mines.	R/U/A	1,2,5,6	9
CO2	Apply statutory knowledge to improve welfare of persons employed in mines	R/U	1,2,5,6,7,10	10
CO3	Learn about qualification ,practical experience, duties and responsibilities of mine officials	R/U/A	1,2,7,8,9,10	8
CO4	Provides knowledge to establish and to location the rescue station, room and conduct the rescue work in mines when	R/U/A	1,2,3,5,7,8,9,10	6

	emergency exist.			
CO5	Learn basic terminology and practical experience , the duties and responsibilities of various competent persons in mines. Implement the technical knowledge and statutory provisions to improve better working conditions in mines.	R/U/A	1,2,3,4,5,6,7,8,9,10	13
CO6	Apply the statutory provisions and technical knowledge to improve safety in mines	U/A	1,2,3,4,5,6,7,8,9,10	14
	Total			60

SCHEME OF EVALUTAION

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	

Total Questions	4	4	4	
-----------------	---	---	---	--

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks
		R		U	A	
1	I	4	1	9(a)	13(a)	
2	II					
3	III		2	10(a)	14(a)	
4	IV					
5	V		3	9(b)	13(b)	
				11(a)	15(a)	
				11(b)	15(b)	
6	VI		7,8	10(b)	14(b)	

					12(a)	16(a)	
					12(b)	16(b)	
Total Questions		8			8	8	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

C18MNG-505E (A)

BOARD DIPLOMA EXAMINATION, (C-18)

END EXAMINATION MODEL PAPER

MINE LEGISLATION

Time : 2 Hours]

[Total Marks: 40

PART-A

Instructions: Answer **ALL** questions. Each question carries **ONE** mark.

08X01=08M

1. Define serious bodily injury.
2. Define the term socket.
3. Define fiery seam.
4. Define the term abandoned working.
5. Define the term approved safety lamp.
6. Define competent person.
7. DEFINE VENTILATION DISTRICT.
8. DEFINE WORKING PLACE.

PART-B

Instructions: Answer **ALL** questions. Each question carries **THREE** marks 04X03=12M

9(a). List the provisions related to hours of work below ground .

(Or)

9(b). List the duties of competent person.

10(a). List the qualifications and experience of instructors.

(Or)

10(b). State the provisions related to multi-section and contiguous working.

11(a). List the provisions related to qualification and appointment of ventilation officer as per CMR-2017.

(Or)

11(b). List the provisions related to duties of support man.

12(a) . List the provisions related to mechanized opencast working.

(Or)

12(b). List the provisions related to storage of explosives.

PART-C

Instructions: Answer **ALL** questions. Each question carries **FIVE** marks 04X05=20M

13(a).State the provisions related to composition and functions of pit safety committee..

(Or)

13(b).List the provisions related to travelling roadways as per CMR-2017.

14(a). State the provisions of practical experience of candidate for mates and blasters examinations.

(Or)

14(b). List the provisions related to depillaring operations as per CMR-2017.

15(a). List the duties responsibilities of manager as per CMR-2017.

(Or)

15(b). State the provisions related to haulage roadways as per CMR-2017.

16(a). List the provisions of development work as per CMR-2017.

(Or)

16(b). List the provisions related to standard of ventilation as per CMR-2017.

BOARD DIPLOMA EXAMINATION, (C-18)

MID-I EXAMINATION MODEL PAPER

MINE LEGISLATION

Time : 1 Hour]

[Total Marks: 20

PART-A

Instructions: Answer **ALL** questions. Each question carries **ONE** mark. 04X01=04M

1. Define the term adult.
2. Define the term reportable injury.
3. Define the term ordinarily employed.
4. Define court of enquiry.

PART-B

Instructions: Answer **ALL** questions. Each question carries **THREE** marks. 02X03=06M

- 5(a). List the provisions related to committee constituted under section 12 of

Mines act -1952

(Or)

5(b). State the provisions related to prior publications of regulations and rules.

6(a). List the provisions of appointment of workmen inspector.

(Or)

6(b). List the provisions of canteen managing committee.

PART-C

Instructions: Answer **ALL** questions. Each question carries **FIVE** marks. 02X05=10M

7 (a). State the provisions related to act not apply in certain cases.

(Or)

7(b). State the bye-laws as per mines act-1952.

8(a) . State the provisions related to medical examination (IME or PME) of persons employed.

(Or)

Provisions related to composition and functions of pit safety committee.

C18MNG-505E (A)

BOARD DIPLOMA EXAMINATION, (C-18)

MID-II EXAMINATION MODEL PAPER

MINE LEGISLATION

Time : 1 Hour]

[Total Marks: 20

PART-A

Instructions: Answer **ALL** questions. Each question carries **ONE** mark. 04X01=04M

1. Define the term metalliferous mine.
2. Define the term permitted explosive.
3. Define principal officer.
4. Define the term rescue trained person.

PART-B

Instructions: Answer **ALL** questions. Each question carries **THREE** marks. 02X03=06M

5(a) . State the provisions of ladders as per MMR-1961

(Or)

Course Title :	MINE SAFETY ENGINEERING	Course Code	18MNG505E[B]
Semester	V	Course Group	Elective
Teaching Scheme in Periods(L:T:P)	45:15:0	Credits	3
Type of course	Lecture + Assignments	Total Contact periods :	60Pds
CIE	60 Marks	SEE	40 Marks

5(b). List the provisions related to appointment of assistant manager or underground manager as per MMR-1961.

6(a) . List the qualifications and experience of superintendent..

(Or)

6(b). List the provisions related to functions of rescue station..

PART-C

Instructions: Answer **ALL** questions. Each question carries **FIVE** marks. 02X05=10M

7(a) state the provisions of practical experience of candidates for mates and blasters examinations
. As per MMR-1961

(Or)

7(b). List the duties of persons employed in mines as per MMR-1961

8(a). List the provisions of establishment and locations of rescue station.

(Or)

8(b) . List the provisions of establishment and locations of rescue room.

.....
MINE SAFETY ENGINEERING

18MNG-505E[B]

PRE REQUISITE:

This course requires the basic knowledge of different types fires occurred in Mines and-how explosion are happening and different types explosion-and how the gases can be detected by using equipments and analysis, and also aware of different types mine disease and preventive measures –and happening of inundation occurred in mines.

Course Outcomes

CO1	Identify the accidents prevention and health and safety in mining industry
CO2	Identify the accident investigation.
CO3	Continuous monitoring of ventilation system and mine lighting

CO4	Identify the gas and measures its percentage and take precautionary steps.
CO5	Identify the causes and carry out the precautionary measures to Miners' diseases
CO6	Identify the causes and carry out the precautionary measures for Mine Inundation

Upon completion of the course the student should be able

COURSE CONTENT

1.0 Concept of Safety in Mines

Duration: 10 periods [L:6 T:4]

Definition of an accident; types of mine accidents; Accidents in Indian Mines; Frequency rates of mine accidents; Statistical analysis of mine accidents; Basic philosophy of accident occurrence and prevention.

2.0 Know the different Accident investigation and Various mine Accidents

Duration: 10 periods [L:6 T:4]

Accident investigation-inquiry – report-Accidents in Opencast mines-accidents due to ground movement-accidents due to electricity - accidents due to rope haulage: Common causes and measures for prevention.

3.0 Continuous Monitoring of Ventilation System and Mine Lighting

Duration : 10periods [L:6 T:4]

Continuous recording and monitoring of Air velocity and Quantity-Tele monitoring systems – Advantages – disadvantages of it-Purpose -Definitions on lighting – Methods of lighting in mines. Places to be illuminated on surface and underground – Standards of Lighting Method of illumination in open cast Mines .

4.0 Gas Detectors

Duration : 08 periods [L : 5 T: 3]

Gas detectors, Uses,— principle on which designed, determination of percentage of gas with them-Recent techniques of gas detection – remote sensing devices, continuous recorders, monitors, infra-red spectrometers, sensors-Carbon Monoxide detection – Warm blooded birds, chemical detectors, Multi gas detector

5.0 MINES DISEASES

Duration : 10periods [L:6 T:4]

Causes and preventive measures of Nystagmus, Ankylostomiasis, dust hazards in mines

Dust control by the respiratory system, Pneumoconiosis, Silicosis, Asbestosis, siderosis, Anthracosis, Symptoms of lung diseases, Dust sampling by thermal precipitator, precautions against harmful dusts

6.0 MINE INUNDATION:-

Duration: 12 periods [L: 8 T: 4]

Inundation in mines-dangers different sources of water-precautions against surface and underground water-precautions-while approaching water logged area. Burn side safety boring apparatus, purpose of dams. Design of a dam construction of concrete dam. Accident due to Inundation- Chasanala accident.

REFERENCES:

1. Misra, G.B., Mine Environment and Ventilation, Oxford University Press, 1993.
2. The Mine Rescue Rules, 1986, Lovely Prakashan, Dhanbad, 1992.
3. Cummings A.B., and Given, I.V., SME Mining Engg. Hand Book Vol. I and II, New York, 1994. 88
4. Sarkar, S.K. and , State of Environment and Development in Indian Coalfields, Oxford and IBH, 1996.

SPECIFIC LEARNING OUTCOMES :

After completion of this chapter the student should able to understand.

1.0 Know the Concept of Safety in Mines

- 1.1 Define the term Mine accident..
- 1.2 What accidents come under the purview of the Mines Act.
- 1.3 How are accidents classified for the purpose of reporting.
- 1.4 List the accidents in Indian Mines.
- 1.5 Calculate the death rates and injury rates .
- 1.6 Statistical analysis of mine accident (Identifying the problem areas)
- 1.7 Where are the majority of accidents taking place.
- 1.8 What are the main causes of accidents.
- 1.9 Classification of accidents by place of occurrence
- 1.10 Classification of accidents by cause.

- 1.11 Explain the basic philosophy of accident occurrence and prevention.
- 2.0 **Know the different Accident investigation and Various mine accidents.**
- 2.1 List the purpose of accident investigation.
- 2.2 How to make an inquiry into an accident.
- 2.3 How to write a report of inquiry into an accident..
- 2.4 Accidents in Opencast mines.
- 2.5 List the causes of accidents in Opencast mines.
- 2.6 List the measures for prevention of accidents in Opencast mines.
- 2.7 List the accidents due to ground movement: Falls of roof and sides in underground coal mines ;Common causes and measures for prevention
- 2.8 List the accidents due to explosives, Common causes and measures for prevention
- 2.9 List the accidents due to electricity , Common causes and measures for prevention.
- 2.10 List the accidents due to rope haulage, Common causes and measures for prevention.
- 3.0 **Introduction to Continuous monitoring of ventilation system and mine lighting**
- 3.1 State the principles of continuous monitoring
- 3.2 Explain about Tele monitoring
- 3.3 Explain about tube monitoring system.
- 3.4 List Advantages –Disadvantages Tele monitoring.
- 3.5 Define the purpose of mine lighting
- 3.6 Definitions of various terms in lighting(a) Lux,(b) Candela,(c) Lumen, (d)Candle,(E) Candle power, (F) M.S.C.P,(g)M.H.C.P,(h) Intensity of Illumination,(i) Glare etc
- 3.7 List the methods of lighting employed in Mines
- 3.8 List the places to be illuminated on the surface and below ground
- 3.9 Explain the methods of illuminating open cast mines
- 3.10 List the effects of Glare and methods of control
- 3.11 List the methods of improving illumination in underground mines
- 4.0 **Mine Gas detectors.**
- 4.1 List out different gas detectors and detector tubes..
- 4.2 Explain the principle on which the detectors are developed or designed.
- 4.3 Explain the method of detecting percentage of methane or fire damp with help of each of above detectors.

- 4.4 Explain the procedure of methane drainage.
- 4.5 List the methods of CO detectors.
- 4.6 Explain the method of detection of CO by chemical detectors.
- 4.7 Explain principle of detecting methane by electrical instruments
 - a. Methanometer M.S.A D-6 type
 - b. K.S.A. type
- 4.8 Describe the operation of using the Methenometers.
- 4.9 Explain operation and working of Ring rose automatic F.D. Detectors
- 4.10 Explain spiralarm type of F.D. detector.
- 4.11 Explain multi gas detectors

5.0 IDENTIFY THE CAUSES AND CARRY OUT THE PRECAUTIONARY MEASURES TO MINE DISEASES.

- 5.1 How does the respiratory system control the dust inhaled by the human being.
- 5.2 Explain Silicosis, Asbestosis, Siderosis, Anthracosis,
- 5.3 Describe the symptoms of lung diseases
- 5.4 What is the dust standards adopted for reducing the incidence of silicosis.
- 5.5 What are the causes and preventive measures of Nystagmus, Ankylostomiasis, dust hazards in mines.
- 5.6 Explain any one Dust sampling method and instrument.
- 5.7 What are the precautionary measures taken against harmful dusts
- 5.8 List the merits of Silicosis

6.0 Understand the dangers due to inundation in mines

- 6.1 Classifies the sources of water in Mines
- 6.2 List different causes of inundation due to surface water
- 6.3 List the precautions against inundation due to surface water.
- 6.4 List precautions against inundation due to underground water.
- 6.5 List different causes of inundation due to underground water
- 6.6 List the precautions to be taken while approaching water logged area with sketch.
- 6.7 Explain the function and the use of burn side safety boring apparatus.

- 6.8 Explain the purpose of water dams in Mines.
- 6.9 List different types of dams and their applicability.
- 6.10 List the factors governing the design of a dam.
- 6.11 Describe the construction of concrete dam.
- 6.12 Constructional details of brick dams with sketches.
- 6.13 Constructional details of Sump and Barriers.
- 6.14 Solve simple problems to calculate the thickness and factor of safety of water dams
- 6.15 What are the precautions to be taken during construction of the dams
- 6.16 Enumerate the causes and circumstances of 1975 Chasnala coal mine disaster and recommend precautions to avoid such occurrences
- 6.17 Explain in detail the construction of any one water dam with a sketch

SUGGESTED LIST OF STUDENT ACTIVITIES

Students are grouped into batches and each batch should not have more than five students.

1. Each student should do any one of the following type activity or any other similar activity related to the course and before conduction, get it approved from concerned Teacher and HOD.
2. Each student should conduct different activity and no repetition should occur
3. Make a Visit to any nearest mine **or** use the information obtained during the vocational training and Submit hand written report of 5 to 10 pages or ppt **or** sketches from the following suggested activities or similar activities.
4. Recognize the importance of Mine air and employ its threshold limits.
5. Analyze the different Rescue apparatus and Recovery methods.
6. Identify the causes and carry out the precautionary measures for Mine Inundation.
7. Identify the causes and carry out the precautionary measures to Miner's diseases.

. LIST OF OPEN SOURCE SOFTWARE/LEARNING WEBSITE

<http://en.wikipedia.org/wiki/Mining>

www.youtube.com

<http://www.mining-journal.com/>

<http://www.miningiq.com/>

<http://www.mining-technology.com/>

CO-PO MAPPING MATRIX

Course Outcome		CL	Linked PO	Teaching Hours
CO1	Know the Concept of Safety in Mines	R/U/A	1,3,5,6,7,8,9,10	10
CO2	Know the different Accident investigation and Various mine accidents.	R/U/A	1,3,4,6,8,9,10	10
CO3	Study of continuous monitoring and mine lighting	R/U/A	1,3,4,5,8,9,10	10

CO4	Mine gas detection	R/U/A	1,2,3,4,8,9,10	08
CO5	Identify the causes and carry out the precautionary measures to Miners' diseases	R/U/A	1,2,3,4,5,6,7,8,9,10	10
CO6	Identify the causes and carry out the precautionary measures for Mine Inundation	R/U/A	1,2,3,4,6,8,9,10	12

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
				11(b)	15(b)		
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MID SEM –I

MODEL QUESTION PAPER

C-18 MNG-505E (B) MINE SAFETY ENGINEERING

Time: 01:00 hours

Max. Marks:20

PART-A

Answer All questions. Each carries one marks.

4X1=4 Marks

1. Define the term Mine accident?
2. What accidents come under the purview of the Mines Act?
3. List the purpose of accident investigation?
4. How to make an inquiry into an accident?

PART-B

2X3=6 Marks

Answer any all questions, and each question carries three marks

- 5 (a) Explain the basic philosophy of accident occurrence and prevention?

OR

(b) Classification of accidents by place of occurrence?

6. (a) List the accidents due to ground movement of Falls of roof and sides in underground coal mines?

OR

(b) List the accidents due to rope haulage and prevention ?

PART-C.

2X5=10 Marks

Answer any all questions, and each question carries five marks.

7. (a) Classification of accidents by place of occurrence?

OR

(b) Calculate the death rates and injury rates?

8 (a) List the purpose of accident investigation?

OR

(b) Write a report of enquiry and investigation into a fatal accident due to fall of roof in a depillaring area killing two loaders on the spot?

MID SEM –II MODEL QUESTION PAPER.
C-18 MNG-505E (B) MINE SAFETY ENGINEERING

Time: 01:00 hour

Max. Marks:20

PART-A

Answer All questions. Each carries one mark.

4X1=4 Marks

1. State the principles of continuous monitoring.
2. Define the term Intensity of Illumination.
3. List the methods of CO detectors.
4. List out different gas detectors and detector tubes.

PART-B

2X3=6 Marks

Answer any all questions and each question carries three marks

5. (a) List the factors for developing spontaneous heating.

OR

(b) List the effects of Glare and methods of control.

6. (a) Explain the principle on which the detectors are developed or designed.

OR

(b) Explain the procedure of methane drainage.

PART-C.

2X5=10 Marks

Answer all questions, and each question carries five marks.

7. (a) Explain the methods of illuminating in open cast mines.

OR

(b) Explain about tube monitoring system .

8. (a) Describe the method of detection of CO by chemical detectors.

OR

(b) Explain the method of detecting percentage of methane or fire damp with help of M S A D-6 type detectors.

BOARD DIPLOMA EXAMINATION,(C-18)
MODEL QUESTION PAPER, END EXAMINATION
C-18 MNG-505E (B) MINE SAFETY ENGINEERING.

Time: 2 hours

Max. Marks:40

PART-A

Answer **All** questions. Each question. Carries 1 mark.

8X1=8 Marks

1. List the accidents in Indian Mines.
2. Define the purpose of mine lighting.
3. Classifies the sources of water in Mines?
4. List the accidents due to explosives?
5. List the merits of Silicosis?
6. List different types of dams and their applicability?
7. What are the principle causes of inundation in coal mines.
8. List causes of inundation due to underground water.

PART-B

Instructions.1.answer any Four question.

2.each question carries three marks.

4X3=12

- 9 (a) State the application and functions of water barriers.

OR

- (b) What are the precautionary measures taken against harmful dusts.

10. (a) List Advantages –Disadvantages Tele monitoring .

OR

- (b) List different types of dams and their applicability.

- 11 (a) What is the dust standards adopted for reducing the incidence of silicosis.

OR

- (b) What are the causes and preventive measures of Nystagmus, Ankylostomiasis , dust hazards in mines.

12. (a) List the precautions against inundation due to surface water.

OR

- (b) List different types of dams and their applicability.

PART-C.

Instructions : 1. Answer any four question.

2. Each question carries five marks.

4 x5 = 20Marks

13 (a) List the accidents due to electricity?

OR

(b)What is the dust standards adopted for reducing the incidence of silicosis

.

14 (a) List the methods of improving illumination in underground mines.

OR

(b) What are the precautions to be taken during construction of the dams.

15. (a) Describe the symptoms of lung diseases.

OR

(b) Explain any one Dust sampling method and instrument.

16. (a) Enumerate the causes and circumstances of 1975 Chasnala coal mine disaster and recommend precautions to avoid such occurrences

OR.

(b) Constructional details of brick dams with sketches.

18MNG-505E[C] GEO-INFORMATICS AND ITS APPLICATIONS IN MINING

Course Title	GEO-INFORMATICS AND ITS APPLICATIONS IN MINING	Course Code	18MNG-505E[C]
Semester	V	Course Group	Elective
Teaching Scheme in Periods (L:T:P)	45:15:0	Credits	3
Type of course	Lecture + Tutorial	Total Periods	60
CIE	60 Marks	SEE	40 Marks

Prerequisites

Basic knowledge of Geo informatics, Surveying

Course Outcomes

A student who has completed this course will be able to:

CO1	Relate the importance of Remote sensing
CO2	Explain Fundamentals of Remote sensing
CO3	Explain FundamentalsGeographic Information Systems
CO4	Relate the importance of Photogrammetry
CO5	Explain the importance of Global Positioning System and LIDAR
CO6	Apply advanced concepts of Geo informatics in Mining

COURSE CONTENT :**UNIT-1 Introduction to Remote sensing**

Duration 8 Periods (L: 6 – T: 2)

Concept and Scope of Remote Sensing. Definitions: Scattering, Absorption, EMR and Spectrum. Energy sources and Radiation principles, EMR interaction with Atmosphere- Process and Characteristics of Remote Sensing System, Advantages and limitations.

UNIT-2 Fundamentals of Remote sensing**Duration 10 Periods (L: 7.5 – T: 2.5)**

Remote Sensor Platforms and Satellite Orbits: Ground, Airborne and Space borne Platforms, Orbital Characteristics – Coverage, Passes, Pointing Accuracy, Geostationary, Sun synchronous, shuttle orbit. Semi synchronous orbit (Molniya orbit) and Quasi-zenith Satellite orbit.

UNIT -3 Fundamentals of Geographic Information Systems**Duration 10 Periods (L: 7.5 – T: 2.5)**

Basic Concepts: definition of GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS. Definition of Vector, Raster model and Topographic model. Conversion between Vector and Raster model.

UNIT -4 Photogrammetry**Duration: 8 Periods (L: 6 – T: 2)**

Introduction: Historical Development and Fundamentals of aerial photography, Vertical and Oblique aerial photography, Classification of Aerial Film Cameras, Digital cameras, Components of aerial Cameras, Camera Calibration. Define Mosaicing.

UNIT -5 Global Positioning System and LIDAR**Duration: 12 Periods (L: 9 – T: 3)**

Global Positioning System: Introduction, Satellite constellation, GPS signals and data, Geo positioning-Basic Concepts. NAVSTAR, GLONASS, Indian Regional Navigational Satellite System (IRNSS), Control Segment, Space Segments, User Segment, GPS Positioning Types- Absolute Positioning, Differential positioning. LIDAR: Definition, Basic Principles and advantages.

UNIT – 6 Applications of Geo informatics in Mining**Duration: 12 Periods (L:9 – T: 3)**

Remote Sensing Scenario in Indian Context. Areas of GIS application, Advantage and Limitation of GIS. Photogrammetric Applications and Products. Overview of Indian Global Positioning System. Applications of LIDAR in Mining.

SPECIFIC OJEVTIVES :

Up on completion of Course student will be able to

1.0 Introduction to Remote sensing

- 1.1. What is Remote sensing
- 1.2. Summarize the Scope of Remote sensing
- 1.3. Define Scattering
- 1.4. Define Absorption
- 1.5. Outline of EMR
- 1.6. What is Spectrum
- 1.7. Summarize the Energy sources
- 1.8. What are Radiation principles
- 1.9. Outline the EMR interaction with Atmosphere
- 1.10. Explain the Process and Characteristics of Remote Sensing System
- 1.11. Explain the Advantages and limitations of Remote sensing

2.0 Fundamentals of Remote sensing

- 2.1 Define Remote sensing Platform
- 2.2 What is Satellite Orbit
- 2.3 Distinguish different types of Platforms
- 2.4 Outline the Various Orbital Characteristics
- 2.5 Explain the Various Orbital Characteristics

3.0 Fundamentals of Geographic Information Systems

- 3.1 Define the Geographic Information Systems
- 3.2 What are the Components of GIS
- 3.3 Summarize the different variables of GIS

- 3.4 Explain the functionality of the GIS
- 3.5 Define Vector model
- 3.6 Define Raster model
- 3.7 What is Topographic model
- 3.8 Discuss the conversion between the Vector model and Raster model

4.0 Photogrammetry

- 4.1 Explain the Historical development of Photogrammetry
- 4.2 Define Aerial photography
- 4.3 What is Vertical photography
- 4.4 Define Oblique Aerial photography
- 4.5 Classify the Aerial film and Digital cameras
- 4.6 What are the components of Aerial cameras
- 4.7 Define Camera calibration
- 4.8 What is Mosaicing

5.0 Global Positioning System and LIDAR

- 5.1 What is Global Positioning System
- 5.2 Define Satellite constellation
- 5.3 Explain the GPS signals and data
- 5.4 What is NAVSTAR
- 5.5 What is GLONASS
- 5.6 Explain Indian Regional Navigational Satellite System
- 5.7 Explain the different Segments
- 5.8 Elaborate the different GPS positioning types
- 5.9 Define LIDAR
- 5.10 Explain the principles and advantages of LIDAR

6.0 Applications of Geo informatics in Mining

- 6.1 Discuss the Remote Sensing scenario in Indian context
- 6.2 Explain the areas of GIS application
- 6.3 Explain the advantages and limitations of GIS
- 6.4 Discuss the various applications and products of Photogrammetry

- 6.5 Explain the Overview of the Indian Global Positioning System
- 6.6 Discuss the applications of LIDAR in Mining

Suggested Student Activities

1. Student visits library to refer to Remote Sensing and GIS magazines
2. Student inspects the available equipment in the Lab to identify the components
3. Quiz
4. Group discussion
5. Surprise test

Reference Books:

- 1) Remote Sensing and Geographical Information Systems by M. Anji Reddy – B.S. Publications.
- 2) Basics of Remote sensing & GIS by S.Kumar- Laxmi Publications.
- 3) Lillesand, T.M. and Kieffer, R.W., 2003. Remote Sensing and Image Interpretation, 5th Edition., Wiley, New York.
- 4) Burrough, Peter A. and Rachael McDonnell, 1998, ‘ Principles of Geographical Information Systems’ Oxford University Press, New York.

Suggested E-Learning references

1. <https://elearning.iirs.gov.in/>
2. https://nrsc.gov.in/User_Manuals
3. https://en.wikipedia.org/wiki/Geographic_information_system
4. http://www.isrsindia.in/saarc_htomem.php
5. www.nptel.com

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching Periods
CO1	Relate the importance of Remote sensing	R,U,A	1,2,3,4,6	8
CO2	Relate the importance of Remote sensing	R,U,A	1,2,4,5,6	10
CO3	Explain Fundamentals Geographic Information Systems	R,U,A	1,2,3,4,5	10
CO4	Relate the importance of Photogrammetry	R,U,A	1,2,3,4,6	8
CO5	Explain the importance of Global Positioning System and LIDAR	R,U,A	1,2,5,6	12
CO6	Apply advanced concepts of Geo informatics in Mining	R,U,A	1,2,5,6,7	12

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
				11(b)	15(b)		
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

BOARD DIPLOMA EXAMINATION, (C-18)
V SEMESTER FIRST MID EXAM MODEL PAPER

GEO-INFORMATICS AND ITS APPLICATIONS IN MINING

Time : 1 Hour]

[Total Marks: 20

PART-A

Instructions: Answer **ALL** questions. Each question carries **ONE** mark.

04X01=04

1. What is Remote sensing
2. What is Scattering
3. Define the term Satellite platform
4. Define the term Satellite Orbit

PART-B

Instructions: Answer any **TWO** questions. Each question carries **THREE** marks.

02X03=06

5. (a) Write a short note EMR interaction with atmosphere

OR

- (b) Briefly explain the Scope of Remote sensing

6. (a) Distinguish different types of Satellite Platforms

OR

- (b) Briefly discuss Geo stationery satellite

PART-C

Instructions: Answer any **TWO** questions. Each question carries **FIVE** marks.

02X05=10

7. (a) Explain the EMR interaction with atmosphere

OR

- (b) What are the advantages and limitations of Remote sensing

8. (a) Distinguish between the Sun synchronous and Geo stationery satellites

OR

- (b) Discuss the different types of Platforms .

BOARD DIPLOMA EXAMINATION, (C-18)
V SEMESTER SECOND MID EXAM MODEL PAPER

GEO-INFORMATICS AND ITS APPLICATIONS IN MINING

Time : 1 Hour] _____ [Total Marks: 20

PART-A

Instructions: Answer **ALL** questions. Each question carries **ONE** mark.

04X01=04Marks

1. What is GIS
2. Define the term Vector
3. What is Photogrammetry
4. Define the term Mosaicing

PART-B

Instructions: Answer any **TWO** questions. Each question carries **THREE** marks. 02X03=06

5. (a) Write a short note on Raster model
OR
(b) Briefly explain the components of GIS
6. (a) Elaborate the Vertical photography
OR
(b) Write a short note on Aerial photography

PART-C

Instructions: Answer any **TWO** questions. Each question carries **FIVE** marks. 02X05=10

7. (a) Distinguish between the Vector and Raster model
OR
(b) Summarize the applications of GIS
8. (a) Explain the components of Aerial cameras
OR
(b) Explain the Various applications of Photogrammetry

BOARD DIPLOMA EXAMINATION, (C-18)
V SEMESTER END EXAM MODEL PAPER

GEO-INFORMATICS AND ITS APPLICATIONS IN MINING

Time : 2 Hours]

[Total Marks: 40

PART-A

Instructions: Answer **ALL** questions. Each question carries **ONE** mark.

8X1=8

- 1) What is Remote sensing
- 2) What is Polygon in GIS
- 3) List out the Various segments of GPS
- 4) Define the term Aerial photograph
- 5) What is GLONASS
- 6) What is NAVSTAR
- 7) What is Sensor
- 8) List the areas of GIS application

PART-B

Instructions: Answer **ALL** questions. Each question carries **THREE** marks.

4X3=12

9. (a) Briefly explain the energy sources of Remote sensing

OR

- (b) Write a short note the basic principles of LIDAR

10. (a) Briefly discuss the Vertical aerial photographs

OR

- (b) Explain the Advantages of LIDAR

11. (a) What are the different Segments of GPS

OR

- (b) Write about absolute positioning of GPS

12. (a) What is the Geo stationary satellite

OR

- (b) Write a short note on Sun synchronous satellite

PART-C

Instruction: Answer **ALL** questions. Each question carries **FIVE** marks.

4X5=20

13. (a) Explain the Process of Remote sensing system

OR

(b) Explain the applications of LIDAR in mining

14. (a) Distinguish between the Vector data model and Raster data model

OR

(b) Explain the overview of the Indian global positioning system

15. (a) Explain Indian Regional Navigational Satellite System

OR

(b) Elaborate the different GPS positioning types

16. (a) Discuss the Various GIS applications

OR

(b) Explain the Various applications of Photogrammetry.

.....

18MNG-506P :: OPENCAST MINE PLANNING AND DESIGN LAB PRACTICE

Course Title :	OPENCAST MINE PLANNING AND DESIGNLAB PRACTICE	Course Code	18MNG-506P
Semester	V	Course Group	Core
Teaching Scheme in Periods(L:T:P)	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods :	45Pds
CIE	60 Marks	SEE	40 Marks

Rationale:

The course is designed to help the student in understanding the planning and designing of opencast mine.

Pre requisites

This course requires the basic knowledge of opencast methods.

Course outcomes

On successful completion of the course, the students will be able to attain below Course Outcome.

Course Content and Blue Print of Marks for SEE

Unit No.	Unit name	Periods
1	Mine planning	6
2	Pit design/ Bench design	6
3	Blasting design	6
4	Production calculations of various machinery's	12
5	Various layout problems.	9
6.	Mine closer planning/reclamation of surface mines.	6

	Total	45
--	--------------	-----------

Course outcomes

Course Outcome		Linked PO
CO1	Understand the importance of planning in selection of equipment's, method of working, production and operation scheduling.	1,2,3,5,6,,8,9
CO2	Understand the importance of bench height, width, slope and overburden dumps to design optimum production	1,2,3,5,6,,8,9
CO3	Understand and able to select suitable blasting design based on geo-physical conditions of various sites.	1,2,3,4,5,7,8,9,10
CO4	Able to calculate the production of each machinery working in mines.	1,2,3,5,6,,8,9
CO5	Able to choose the best method of working and machinery for excavation.	1,2,3,5,6,,8,9
CO6	Able to do the reclamation operation for mine closers.	1,2,3,5,6,,8,9

LIST OF EXPERIMENTS:

I. Mine planning.

1. Land lease and feasibility studies etc.
2. Choose best method of opening of open cast mine.
3. Select excavation machinery's for various productions.
4. Different transportation systems.

II. Pit design/bench design.

5. Design bench size (Height, Width, slope)
6. Calculate face length and no. of benches required for given production.
7. Design of slope stability.
8. Study different bench failures.
9. Design overburden dumps.

10. Design of haul roads.

III. Blasting design.

- 11. Study of different blasting patterns for geo-physical conditions of site.
- 12. Study of burden, spacing, sub grade drilling and no. of holes in each blast.
- 13. Calculate powder factor, detonating factor etc.

IV. Production calculations of various machinery's.

- 14. Calculate shovel production per month.
- 15. Calculate dragline production per year.
- 16. Calculate bucket wheel excavator production per shift.

V. Various layout problems.

- 17. Layout of a highly mechanized opencast coal mine with an output of 5000 tons/day. The deposit is 20 m thick and dipping at 4°. Introduction, description of the mining layout, main machineries, other equipment to be procured, method of working, drilling and blasting, production and productivity, etc.
- 18. Layout of a highly mechanized lignite mine with an output of 3 million tons of lignite per annum. The lignite deposit is 20 m thick and flat. Introduction, description of the mining layout, method of working with the help of Bucket wheel excavator and spreader combinations per overburden and the method of lignite transport is by rail main equipment, other equipment to be procured. Mine drainage and pumping system, land reclamation and re-vegetation. production and productivity, etc.
- 19. Layout of a highly mechanized coal mine with an output of 1.25 million tons of coal per annum. The coal seam is 10 m thick and occurring at a depth of 25 mts from the surface. Introduction, description of the mining layout, main equipment and auxiliary equipment. Method of working, drilling and blasting, coal and overburden benches, production and productivity, etc.

VI. Mine closer planning/reclamation of surface mines.

- 20. Mine closure rules/norms.
- 21. Different aspects of mine closure.
- 22. Mine closure plan-stages.

REFERENCE BOOKS.

- 1. Surface mining by T.N. Singh.
- 2. Surface mining technology by S.K Das
- 3. Explosives and blasting technology by G.K Pradhan.
- 4. Explosives and blasting practices in mines by S.K Das
- 5. Elements of mining technology volume – 1 by D.J Deshmukh\

MID EXAMINATION -I and II

One questions to be chosen from the list of experiments 1 to 10 for Mid examination -I and from 11 to 16 for mid examination -II. Student can select one question by lottery method.

Sl. No	Description	Marks
1	Writing procedure	5
2	Sketch / Drawings	5
3	Experiment	5
4	Viva voice	5
Total		20

INTERNAL EVALUATION

The internal evaluation of a student in the laboratory will be carried out based on the following objectives

Sl. No	Description	Marks
1	Assignment	10
2	Seminar /Model preparation	10
Total		20

END EXAMINATION

One questions to be chosen from the list of experiments1 T to 22. Student can select one question by lottery method.

Sl. No	Description	Marks
1	Writing procedure	10
2	Sketch / Drawing	05
3	Experiment	15
4	Viva voice	10
Total		40

State Board of Technical Education and Training, Telangana

Semester End Examination Model Question paper

DMNG V Semester Practical Examination

Corse Code: 18MNG-506P

Duration: 2 hours

Course Name: Opencast mine planning and design lab practice

Max.Marks:40

Instructions to the Candidates:

(i) Answer any One of the following Questions.

1. Mine having soft overburden and mineral select the excavator and calculate the production..
2. Mine having high stripping ratio (8to10: 1) select the excavator and calculate the production.
3. Calculate face length and no.of benches required for x million tones production.
4. Explain selection of bench parameters for various conditions.
5. Explain design of overburden dumps in optimum area.
6. Derive the factor of safety of a bench.
7. Study of different blasting patterns for geo-physical conditions of site.
8. Calculate 4.5m³ shovel production per month.
9. Explain the design of haul roads.
10. Explain mine closure rules/norms.

18MNG-507 P :: ROCK MECHANIC AND STRATA CONTROL LAB PRACTICE.

Course Title:	ROCK MECHANICS AND STRATA CONTROL LAB PRACTICE	Course Code	18MNG 507 P
Semester	V	Course Group	Core
Teaching Scheme in Periods(L: T:P)	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods:	45Pds
CIE	60 Marks	SEE	40 Marks

PRE-REQUISITE

Knowledge of basic mathematics, sample collection and methods of mining

COURSE OBJECTIVE

The objective of Rock mechanics to know the important of rock and physical properties and mechanical properties of rock and rock testing and rock mass classification of rocks. Preparation of sample for as per standards. Determination of Physico – Mechanical properties of rocks

COURSE OUTCOME

Students who had completed the course will be able to

Course outcome		Linked Exercise	CL (R/U/A)	Linked PO	Teaching Periods
CO1	Sample collection and Specimen Preparation	1,2,3	R/U	1,2,3,4,6	5
CO2	Uni-axial compressive strength of rock specimen	2,3,5,6,2	R/U	1,2	6
CO3	Tri-axial Compressive Strength rock specimen	4,5,6,7,8	U/A/A	2,3,5	5
CO4	Conduct Tensile test on UTM .	2,3,9	R/U/A	3,4,8,9,10	10

CO5	Conduct Compressive Strength test on UTM.	2,4,6	R/U/A	2,3,4	7
CO6	Determination of point load strength index of the rock sample.	3,4,6,7	R/U/A	2,3,4,7	6
CO7	Determination of slake durability index of rock sample.	3,5,7,8	R/U/A	4,6,8	6

LIST OF EXPERIMENTS

S.No	Major Topics	No. of Periods
1	Sample collection and Specimen Preparation	05
2	Uni-axial compressive strength of rock specimen	06
3	Tri-axial Compressive Strength rock specimen	05
4	Conduct Tensile test on UTM.	10
5	Conduct Compressive strength test on UTM.	7
6	Determination of Point load strength index of the rock sample	6
7	Determination of Protodyakonov's strength index of rock sample	6

LIST OF EQUIPMENTS

S. No.	Equipment required for testing.
1	UTM machines.
2	point loading machines.
3	protodyakonov's equipment
4	Hardness test machines.

REFERENCES

1. Rock mechanics for Engineers, by B.P.Verma
2. Elements of Mining Technology, by D.J.Deshmukh –Vol 1,2 ,3
3. Wining and working Vol 1,2 ,by R.T.Deshmuk
4. Rock Mechanics & Ground Control, by D.Biswas, Lovely Prakashan, Dhanbad.
5. Rock Mechanics- Leonard Obert and Wilbur I.Duvall

LIST OF OPEN SOURCE SOFTWARE/LEARNING WEBSITE

1. <https://www.youtube.com/watch?v=C8knKG05IYA>
2. <http://www.tcf.com/industries-applications/applications/Mining-Ventilation>
3. https://en.wikipedia.org/wiki/Underground_mine_ventilation
4. <http://miningquiz.com/minegasqa.htm>
5. http://miningquiz.com/powerpoints/mine_gases.htm
6. http://miningquiz.com/pdf/mine_gases.htm
7. http://miningquiz.com/pdf/Mine_Gases/2008-123.pdf
8. <http://web.mst.edu/~tien/218/Gas-OH.pdf>

18MNG-508P :: MINE ENVIRONMENTAL ENGINEERING LAB PRACTICE

Course Title:	MINE ENVIRONMENTAL ENGINEERING LAB PRACTICE	Course Code	18MNG 508P
Semester	V	Course Group	Core
Teaching Scheme in Periods(L: T:P)	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods:	45Pds
CIE	60 Marks	SEE	40 Marks

PRE-REQUISITE

Knowledge of Mine environment, different types rescue and ventilation survey apparatus.

COURSE OBJECTIVE

The objective of Mine Environmental Engineering Lab Practice is to analyze the mine environment during the mining activity. It also gives knowledge rescue and recovery apparatus. In this course main emphasis is given the rescue operations to be carried out for safe day to day mining activity.

COURSE OUTCOME

Students who had completed the course will be able to

Course outcome		Linked Exercise	CL (R/U/A)	Linked PO	Teaching Periods
CO1	Recognize the percentage of toxic and inflammable Mine and Employ the principles to predict the temperature, humidity contained in underground air	1,12	R/U	1,2,3,4,6	6
CO2	Identify the precautionary measures for Mine fire	2	R/U	1,2	3
CO3	Analyze the different Rescue apparatus and Recovery methods.	4,5,6,7,8	U/A	2,3,5	21
CO4	Measure the underground quality and quantity of air	3,9	R/U/A	3,4,8,9,10	9

CO5	Make provision of ventilation in any underground mine by Artificial means.	10,11	R/U	2,3,4,	6
-----	--	-------	-----	--------	---

LIST OF EXPERIMENTS

S .No	Name of the Experiment	Periods
1	To detect of carbon monoxide and methane using detector tub	3
2	To study Various Fire Fighting Equipments Study and sketch fire fighting equipments for class A, B,C, D, E Fires.	4
3	To study Coward's diagram	3
4	Identification of the parts of flame safety lamp.	3
5	To study of constructional features & working of self-contained breathing apparatus	5
6	To study of constructional features & working of self-Rescuer	3
7	To study of constructional features & working of Gas Mask.	3
8	Estimation of air cooling power using Kata thermometer.	5
9	Carry out qualitative survey for determining the relative humidity of air	5
10	Conduction of ventilation survey for quantity of air using anemometer and velometer	5
11	Study of Centrifugal fans	3
12	Study of Axial flow fans	3
	Total	45

LIST OF EQUIPEMNRTS

S. No.	NAME OF THE EQUIPMENTS REQUIRED
1	Carbon monoxide detectors
2	Fire fighting equipments for class A, B, C, D, E Fires.
3	Chart of Coward's diagram
4	Self-contained breathing apparatus
5	Self-Rescuer
6	Gas Mask.
7	Kata thermometer.

8	Hygrometer
9	Flame safety lamp.
10	Anemometer,
11	Velometer
12	Model of axial flow fans
13	Model of centrifugal fans

REFERENCES

1. Mine fires, Rescue, Recovery and Inundation M A. Ramulu
2. Mine ventilation S. Ghatak
3. UMS Volumes
4. Statham series
5. Mine environment and its control G B Mishra

LIST OF OPEN SOURCE SOFTWARE/LEARNING WEBSITE

9. <https://www.youtube.com/watch?v=C8knKG05lYA>
10. <http://www.tcf.com/industries-applications/applications/Mining-Ventilation>
11. https://en.wikipedia.org/wiki/Underground_mine_ventilation
12. <http://miningquiz.com/minegasqa.htm>
13. http://miningquiz.com/powerpoints/mine_gases.htm
14. http://miningquiz.com/pdf/mine_gases.htm
15. http://miningquiz.com/pdf/Mine_Gases/2008-123.pdf
16. <http://web.mst.edu/~tien/218/Gas-OH.pdf>

18MNG509 P::C Programming lab practice:

Course Title :	C Programming lab Practice	Course Code	18MNG-509 P
Semester	V	Course Group	Core
Teaching Scheme in Periods(L:T:P)	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods :	45
CIE	60 Marks	SEE	40 Marks

Pre requisites

Knowledge of Computer Operation.

Course outcomes

Course Outcome	
CO1	Write programs using input/output statements, variables and operators
CO2	Demonstrate decision making, branching and loop statements
CO3	Construct programs on arrays and strings
CO4	Develop programs using functions, structures and unions

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

COURSE CONTENTS:

List of Programmes:

1. Input/output statements, variables and operators

- 1.1 Exercise on structure of C program
- 1.2 Exercise on Keywords and identifiers
- 1.3 Exercise on constants and variables

- 1.4 Execution of simple C program
- 1.5 Exercise on operators and expressions
- 1.6 Exercise on special operators
- 1.7 Exercise on input and output of characters
- 1.8 Exercise on formatted input and output

2. Decision making, branching and loop statements

- 2.1 Exercise on simple if statement
- 2.2 Exercise on if..else statement
- 2.3 Exercise on else..if ladder statement
- 2.4 Exercise on switch statement
- 2.5 Exercise on conditional operator
- 2.6 Exercise on while statement
- 2.7 Exercise on for statement
- 2.8 Exercise on do...while statement

3. Arrays and strings

- 3.1 Exercise on one dimensional arrays
- 3.2 Exercise on two dimensional arrays
- 3.3 Exercise on strings

4.Functions, Structures and Unions

- 4.1 Exercise on user-defined function
- 4.2 Exercise on recursion
- 4.3 Exercise on structure
- 4.4 Exercise on array of structures

REFERENCE BOOKS

- 1. Let Us C -- Yeshwanth Kanetkar BPB Publications
- 2. Programming in ANSI C -- E. Balaguruswamy Tata McGrawHill
- 3. C The complete Reference -- Schildt Tata McGraw Hill

E-learning links

- 1. <http://www.tutorialspoint.com/cprogramming/>
- 2. http://www.indiabix.com/online-test/c-programming_Test/

3. <https://fresh2refresh.com/c-programming/>
4. <http://www.learn-c.org/>
5. <https://www.javatpoint.com/c-programming-language-tutorial>
6. <https://www.cprogramming.com/tutorial/c-tutorial.html>

CO-PO Mapping Matrix

Course Outcome		CL	Linked PO	Teaching periods
CO1	Write programs using input/output statements, variables and operators	R, U, A	1,2,3,4,8,9,10	5
CO2	Demonstrate decision making, branching and loop statements	R, U, A	1,2,3,4,8,9,10	15
CO3	Construct programs on arrays and strings	R,U, A	1,2,3,4,8,9,10	10
CO4	Develop programs using functions, structures and unions	U, A	1,2,3,4,8,9,10	15
CO5	Write programs using input/output statements, variables and operators	R, U, A	1,2,3,4,8,9,10	5
Total Sessions				45

DIPLOMA IN MINING ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
C18 MNG 510P – PROJECT WORK
V SEMESTER

S. No	Subject	Duration	Items	Max Marks	Remarks
1	PROJECT		1.project I spell (Abstract submission)	25	
			2. project II spell (Final submission)	25	
			3.a)Maintenance of Log Book	15	
			b)Record work	15	
			4.a) Seminar	10	
			b) Viva Voce	10	
Total :				100	

The Project shall carry 100 marks and pass marks is 50% a candidate failing to secure the minimum marks should repeat the Project work.

Thrust areas identified for Project work

According to the local needs, the following major projects are suggested:

1. Open cast Mining
2. Mine Machineries
3. Mine Environmental Engg.
4. Mine Ventilation
5. Mine Disasters
6. Mining Geology

7. Mine Surveying
8. Underground Metaliferrous Mining
9. Advanced Open cast Machineries
10. Any concerned mining Projects
11. Rock Mechanics and Ground control
12. Controlled blasting techniques

Project report

The Project Report should consist of following items.

1. Introduction
2. Review of Literature
3. Study Area
4. Methodology/Design/fabrication/Tests
5. Result and Discussion
6. Conclusion and scope for future study
7. References.

Standards of the Project Report

1. Project reports should be typed neatly in **Times New Roman letters** with
 - (a) Font size 14 for titles
 - (b) Font size 12 for text on both sides of the paper
 - (c) 1.5 line spacing on a A4 size paper (210 x 297 mm)
 - (d) The margins should be: Left - 1.5", Right - 1", Top and Bottom - 0.75". 2.
2. Total number of reports (Soft bound) to be prepared is:
 - (a) One copy to the department /library
 - (b) One copy to the concerned guide(s)
 - (c) One copy to the candidate.
 - (d) One copy to the Industrial training Officer
3. Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.
4. Every copy of the report must contain
 - a. Inner title page (White)
 - b. Outer title page with a plastic cover
 - c. Candidate declaration and Certificate in the format enclosed both from the institution and the organization where the project is carried out.
5. An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

6. Chapters(to be numbered in Arabic) containing

Introduction which usually specifies the scope of work and its importance and relation to previous work and the present developments.

Main body of the report divided appropriately into chapters, sections and subsections.

The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc. The chapter must be left or right justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14.

The body or the text of the report should have font size 12. The figures and tables must be numbered chapter wise

The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

Reference or Bibliography: The references should be numbered serially in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order.

DMNG – Vth Semester
Course: SKILL UPGRADATION
Methodology: ACTIVITY
Semester : V

Credits :2.5
Total Contact Periods : 105

Suggested Course Outcomes

CO.1 Address the identified needs of the community collaboratively to facilitate positive social change.

- a. Prepare a chart related to the topics covered in the present semester.
- b. Listen to expert talk, guest lecture, YouTube video and write a summary.
- c. Participate in Haritha Haram and submit a small report about the activities.
- d. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
- e. Seminar on problems with possible solutions in the campus or nearby places
- f. Group discussions or enacting a play on topics creating awareness about socio-economic problems
- g. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- h. Participate in NCC

(PO 5, 6, 7, 8, 9, 10)

CO.2 Listen attentively to others and respond appropriately

- a. Listen to expert talk, guest lecture, YouTube video and write a summary.
- b. Participating in Group discussions or enacting a play on topics creating awareness about socio-economic problems that can be mitigated by technologies.
- c. Participate in quiz on technical aspects or current affairs
- d. Participate in Mock Interview

(PO 5, 7, 8, 9, 10)

CO.3 Adapt your style to the occasion, task, and audience

- a. Group discussions or enacting a play on topics creating awareness about socio-economic problems that can be mitigated by technologies.
- b. Seminar on problems with possible solutions in the campus or nearby places
- c. Participate in Mock Interview

(PO5, 6, 7, 8, 9, 10)

CO.4 Articulate ideas in various formats including oral, written, nonverbal, visual, and electronic devices.

- a. Prepare a chart related to the topics covered in the present semester.
- b. Refer to an e-journal and submit a summary report on upcoming technologies.
- c. Visit factory / industry and submit a report/PPT on the observations made.
- d. Prepare a mini project and submit report.
- e. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
- f. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- g. Seminar on problems with possible solutions in the campus or nearby places

h. Participate in Mock Interview

(PO5, 6, 7, 8, 9, 10)

CO.5 Demonstrate ability to recognize and effectively manage ambiguous ideas, experiences and situations

- Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- Seminar on problems with possible solutions in the campus or nearby places

(PO5, 6, 7, 8, 9, 10)

CO.6 Analyze the interconnections between individuals and society as well as how individual actions have an impact on others.

- Participate in Haritha Haram and submit a small report about the activities.
- Participate in Swatch Bharath and write an essay on the importance of the program
- Participate in NCC

(PO5, 6, 7, 8, 9, 10)

CO.7 Utilize others' ideas, strengths, knowledge, and abilities to foster an inclusive environment & Develop and sustain healthy and meaningful relationships with others

- Prepare a mini project and submit report.
- Participate in Haritha Haram and submit a small report about the activities.
- Participate in Swatch Bharath and write an essay on the importance of the program
- Participate in NCC

(PO5, 6, 7, 8, 9, 10)

CO.8 Ability to recognize their strengths and those of others to work towards a shared vision.

- Prepare a mini project and submit report.
- Participate in Haritha Haram and submit a small report about the activities.
- Participate in Swatch Bharath and write an essay on the importance of the program
- Participate in NCC

(PO5, 6, 7, 8, 9, 10)

CO.9 Act in alignment with one's own values to contribute to one's life-long growth and learning.

- Physical activities such as sports, yoga, meditation and other relaxation techniques

CO.10 Gain, process, and act upon knowledge regarding the effects of individual, community, national, and international level choices on ecosystems and people.

- Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
- Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
- Seminar on problems with possible solutions in the campus or nearby places

(PO5, 6, 7, 8, 9, 10) CO

Outcome

CO/PO Mapping

CO1	Address the identified needs of the community collaboratively to facilitate positive social change.	5, 6, 7, 8, 9, 10
CO2	Listen attentively to others and respond appropriately	5, 6, 7, 8, 9, 10
CO3	Adapt your style to the occasion, task, and audience	5, 6, 7, 8, 9, 10
CO4	Articulate ideas in various formats including oral, written, nonverbal, visual, and electronic devices.	5, 6, 7, 8, 9, 10
CO5	Demonstrate ability to recognize and effectively manage ambiguous ideas, experiences and situations	5, 6, 7, 8, 9, 10
CO6	Analyze the interconnections between individuals and society as well as how individual actions have an impact on others.	5, 6, 7, 8, 9, 10
CO7	Utilize others' ideas, strengths, knowledge, and abilities to foster an inclusive environment & Develop and sustain healthy and meaningful relationships with others	5, 6, 7, 8, 9, 10
CO8	Ability to recognize their strengths and those of others to work towards a shared vision	5, 6, 7, 8, 9, 10
CO9	Act in alignment with one's own values to contribute to one's life-long growth and learning.	5, 6, 7, 8, 9, 10
CO10	Gain, process, and act upon knowledge regarding the effects of individual, community, national, and international level choices on ecosystems and people.	5, 6, 7, 8, 9, 10

(PO5, 6, 7, 8, 9, 10) CO	Outcome	CO/PO Mapping
CO1	Address the identified needs of the community collaboratively to facilitate positive social change.	5, 6, 7, 8, 9, 10
CO2	Listen attentively to others and respond appropriately	5, 6, 7, 8, 9, 10
CO3	Adapt your style to the occasion, task, and audience	5, 6, 7, 8, 9, 10
CO4	Articulate ideas in various formats including oral, written, nonverbal, visual, and electronic devices.	5, 6, 7, 8, 9, 10
CO5	Demonstrate ability to recognize and effectively manage ambiguous ideas, experiences and situations	5, 6, 7, 8, 9, 10
CO6	Analyze the interconnections between individuals and society as well as how individual actions have an impact on others.	5, 6, 7, 8, 9, 10
CO7	Utilize others' ideas, strengths, knowledge, and abilities to foster an inclusive environment & Develop and sustain healthy and meaningful relationships with others	5, 6, 7, 8, 9, 10
CO8	Ability to recognize their strengths and those of others to work towards a shared vision	5, 6, 7, 8, 9, 10
CO9	Act in alignment with one's own values to contribute to one's life-long growth and learning.	5, 6, 7, 8, 9, 10
CO10	Gain, process, and act upon knowledge regarding the effects of individual, community, national, and international level choices on ecosystems and people.	5, 6, 7, 8, 9, 10

Note: The above COs may map to other POs from 1 to 4 apart from PO's 5 to 10 depending on the topic

Suggested Student Activities

1. Prepare a chart related to the topics covered in the present semester.
2. Refer to an e-journal and submit a summary report on upcoming technologies.
3. Visit nearby Mines / Processing plants and submit a report/PPT on the observations made.
4. Prepare a mini project and submit report.
5. Listen to expert talk, guest lecture, YouTube video and write a summary.
6. Participate in Haritha Haram and submit a small report about the activities.
7. Prepare a report / PPT / poster on waste water recycling or any eco-friendly practices.
8. Take up a case study on identification of latest technologies to tackle day to day problems such as pollution control or traffic management and submit a report / PPT/ poster
9. Participate in Swatch Bharath and write an essay on the importance of the program
10. Group discussions or enacting a play on topics creating awareness about socio-economic problems
11. Physical activities such as sports, games, yoga, meditation and other relaxation techniques
12. Participate in quiz on technical aspects or current affairs
13. Seminar on problems with possible solutions in the campus or nearby places
14. Participate in NCC
15. Participate in Mock interviews

Note: The above student activities will be assessed using rubrics. A sample rubrics template is given below. The subject teacher can assess students using rubrics with at least four relevant aspects.

RUBRICS MODEL(For assessing Presentation skills)

Aspects	Needs improvement	Satisfactory	Good	Exemplary
Collection of data	Collects very limited information	Collect much Information with very limited relevance to the topic	Collects some basic information with little bit of irrelevance	Collects a great deal of information with relevance
Presentation of data	Clumsy presentation of data	Presents data well; but presentation needs to be more meaningful	Presents data well but need to improve clarity	Presents data in an understandable yet concise manner

Fulfill team's roles & duties	Performs very little duties but Unreliable.	Performs very little duties and is inactive	Performs nearly all duties	Performs all duties of assigned team roles
Shares work equally	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded
Interaction with other team mates	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening to others	Listens, but sometimes talks too much	Listens and speaks a fair amount
Audibility and clarity in speech	Hardly audible and unclear	Very little audibility and clarity	Audible most of the time with clarity	Audible and clear
Understanding content	Lacks content understanding and is clearly a work in progress	Little depth of content understanding	Some depth of content understanding is evident but needs improvement	Insight and depth of content understanding are evident
Content Presentation	Content is inaccurate and information is not presented in a logical order making it difficult to follow	Content is accurate and information is not presented in a logical order making it difficult to follow	Content is accurate but some information is not presented in a logical order but is still generally easy to follow	Content is accurate and information is presented in a logical order

Suggested additional aspects for assessing Leadership Qualities:

1. Carrying self
2. Punctuality
3. Team work abilities
4. Moral values
5. Communication skills
6. Ensures the work is done in time

Suggested additional aspects for assessing "Participation in social task"

- 1 Interested to know the current situation of society.
- 2 Shows interest to participate in given social task.
- 3 Reliable

4 Helping nature

5 Inter personal skills

6 Ensures task is completed

Suggested additional aspects for assessing “Participation in Technical task”

1. Updated to new technologies

2. Identifies problems in society that can be solved using technology

3. Interested to participate in finding possible technical solutions to identified project

4. Reliable

5. Interpersonal skills

Suggested additional aspects for Carrying Self:

1 Stand or sit straight.

2 Keep your head level.

3 Relax your shoulders.

4 Spread your weight evenly on both legs.

5 If sitting, keep your elbows on the arms of your chair, rather than tightly against your sides.

6 Make appropriate eye contact while communicating.

7 Lower the pitch of your voice.

8 Speak more clearly.

SKILL UPGRADATION (RUBRICS)

- Download a research paper /ppts/NPTL videos on method of working coal and metal/ Opencast mines/rock mechanics and explain collection of different types of bore hole data download a research paper and explain
- Draw formation of Coal and Overburden benches layouts
- Conduct seminars on various Mining Industries Organization behavior and style of administration.
- Compare conventional and modern mining methods and give power point presentation
- Prepare team wise each batch collect production Statistical details of various mineral i.e Coal/Bauxite/Lime stone etc.,
- Collect from internet/down load modern technology relative Advanced Mining in underground mine/Open cast mines
- Visiting near by mining Industries i.e Rescue station/Exploration/mines
- Study various case-study on mine accidents analysis i.e SCC Limited/Coal India/Mines and Geology
- Attending yoga classes
- Clean and green activities to protect the environment in the institute and near by places
- Attending motivational classes given by experts
- Visiting nearby public places and extending help to the needs as the part of social responsibility

- Guiding junior students in academic affairs.
- Must register and study the courses offered by NPTEL/Swayam/MOOCs

@@@