Faculty of Engineering & Technology

Study and Evaluation Scheme

Of

Diploma (Engineering)- 3Years

Diploma (Engg.)- Mining Engineering

II & III Year

(Applicable w.e.f Academic Session 2013-16 till revised)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

**** The University Authorities reserve all the rights to make any additions/ deletions or changes/ modifications to this syllabus as deemed necessary.**

AKS University, Satna

Sherganj, Panna Road, Satna (MP) 485001

Study & Evaluation Scheme

of

Diploma (Engineering) (Mining Engg.)

SUMMARY

Programme :	**Diploma (Mining)**		
Duration :	Three year full time (Six Semesters)		
Medium :	**Hindi &** English Both		
Minimum Required Attendance :	75 %		
Maximum Credits:	105+48 (First Year)= 153		
Evaluation Assessment :	**Internal**	**External**	**Total**
	50	100	150

Internal Evaluation (Theory/ Practical Papers)

	Sessional-I	**Sessional-II**	**Continuous Assessment & attendance**
	10	10	10+20= 30

Duration of Examination :	**External**	**Internal**
	3 hrs.	2 hrs

To qualify the course a student is required to secure a minimum of 31% marks in aggregate including the semester end examination, internal assessment evaluation (Both theory & Practical Papers)

A candidate who secures less than 31% or Grade **'D**' of marks in a Subject/Paper(s) shall be deemed to have failed in that Subject/Paper(s). In case a student has secured less than 31% or Grade **'R'** in Subject/Paper(s), he/she shall be deemed to re-appear (ATKT Examination) in Subject/Paper(s) to achieve the required percentage (Min. 31%) or grade (Min. D) in the Subject/Paper(s).

Question Paper Structure

1. *The question paper shall consist of 26 questions in three Sections. Out of which Section-A shall be of Objective type 10 questions and will be compulsory. (weightage 2 marks each).*
2. *Section-B shall contain 10 Short answer type questions and students shall have to answer any eight (weightage 5marks each).*
3. *Out of the remaining six question s are long answer type questions, student shall be required to attempt any four questions. The weightage of Questions shall be 10 marks each.*

Faculty of Engineering & Technology
Department of Mining Engineering

Diploma (Mining Engg.)

III Semester

TEACHING & EXAMINATION SCHEME

S.N.	Subject Code	Subject	Period			Credit
			L	T	P	
1	10MI301	Introduction to Mining	4			4
2	10GE302	Mining Geology-I	4			4
3	10MI303	Mine Developmant- Drilling & Blasting	4			4
4	10MI304	Mine Environmental Engineering	4			4
5	10CE305	Mine Surveying - I	4			4
6	10SD306	Soft Skills Development			2	1
7	10GE351	Mining Geology-I - Lab			2	1
8	10MI352	Mine Developmant- Drilling & Blasting-Lab			2	1
9	10MI353	Mine Surveying - I - Lab			2	1
			21	0	8	24

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Diploma (Mining Engg.)

IV Semester

TEACHING & EXAMINATION SCHEME

Sr.no.	Subject Code	Subject	Th.	T	P	Credit
1	10MI401	Method of Work (Coal)	**3**	**2**	**0**	**4**
2	10MI402	Surface Mining	**4**	**0**	**0**	**4**
3	10MI403	Mining Legislation & General Safety	**4**	**0**	**0**	**4**
4	10MI404	Mine Environment II	**3**	**1**	**0**	**4**
5	10GE405	Geology II	**3**	**1**	**0**	**4**
6	10SD406	SSD	**0**	**0**	**2**	**1**
7	10MI451	Method of Work (Coal) Lab	**0**	**0**	**2**	**1**
8	10MI452	Mine Environment II (Lab)	**0**	**0**	**2**	**1**
9	10GE453	Geology II (Lab)	**0**	**0**	**2**	**1**
10	10MI454	Practical Training & Assessment	**During IVth & Vth Semester break for 45 days. Marks to be awarded in Vth Semester**			
			17	**4**	**8**	**24**

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V Semester

TEACHING & EXAMINATION SCHEME

Sr.No.	Subject Code	Subject	Periods/Week			
			L	T	P	Credits
1.	10MI501	Metal Mining	3	1	-	4
2.	10MI502	Mining Machinery I	3	1	-	4
3.	10MI503	Advanced Mine Surveying	3	1	-	4
4.	10GE504	Rock Mechanics & Strata Control	3	1	-	4
5.	10MI505	Mining Hazard & Safety I	3	1	-	4
6.	10MI551	Semester break Training Report submission	-		-	4
7	10GE552	Rock Mechanics (Lab)	-		2	1
8.	10MI553	Mining Machinery (Lab)	_		2	1
9.	10MI554	Mine Surveying (Lab)	-		2	1
10.	10MI555	Metal Mining (Lab)	-		2	1
11.	10Mi556	Mines Planning & Design Laboratory (Lab)	-		2	1
		Total				**29**

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VI Semester

TEACHING & EXAMINATION SCHEME

Sr.no.	Subject Code	Subject Name	L	T	P	Credit
1.	10MI601	Mine Hazard & Safety II	3	1	-	4
2	**Elective (Choose any one)**		1	1	-	2
	10MI602-A	Mine Management , and Entrepreneurship				
	10MI602-B	Mine Electrical Engineering, Energy Resources & Savings in mining				
3	10MI603	Mining Machinery II	3	1	-	4
4	10MI604	Mine Sampling Assaying, Coal/Mineral Processing	3	1		4
5	**Project Work(any one from A or B)**					6
	10MI651-A	Surface/Opencast Mine				
	10MI651-B	Underground Coal Mine				
6.	10MI652	Mining Machinery-II (Lab)			4	2
7.	10MI653	Mine Sampling Assaying and Mineral Processing (Lab)			4	2
8.	10MI654	Mine Hazard & Safety (Lab)			4	2
Total						28

Diploma (Engg.)
Mining Engineering
Semester-III
INTRODUCTION TO MINING

Unit-I

Mining Terminology/Definitions, Mineral Resource of India, Mineral and energy resources of world,

Mineral resources of MP & Chattisgarh; Minerals - their occurrences, production trend and uses.

Unit-II

Elementary ideas about Mining, Underground, Opencast/Surface Mining for Coal (and Lignite) and Non-Coal Minerals, Comparison of underground and surface mining, Coal Bed Methane (CBM), Placer Mining, Sea Bed Mining etc.

Unit- III : Exploration and Prospecting

Prospecting & Exploration- Reconnaissance, Principles and methods, Trenching & Pitting.
Boring: Principles of boring; surface layout; Chief uses of boreholes, percussive method by rigid rods, rope drilling, boring tools used in percussive method.
Rotary Boring-various systems, different types of bits, water flushing &drilling mud, mud flushing, core recovery, single tube & double tube core barrel,wire line core barrel, diamond drilling. Borehole logging.
Trouble during boring operations- caving of wall of bore hole, loss ofwater, deviation of bore hole. survey of bore holes, loss of bit, rod damage or disengagement inside the hole, excessive wear of bit,breakage or loss of diamond.

Unit-IV

Loading : Basic Loading equipment and their application.
Transportation: Basic idea about Transportation equipment and their application/use in mines..

Text Books

1. Dr G.K.Pradhan, Explosives & Blasting Techniques, Mintech Publications, Bhubaneswar
2. D.J.Deshmukh, Elements of Mining Technology, Vol. I, Denett & Co., Nagpur
3. Dr T.N.Singh, Surface Mining, Lovely Prakashan, Dhanbad
4. Dr S.K.Das, A Handbook on Surface Mining Technology, Lovely Prakashan, Dhanbad
5. R.D. Singh, Principles & Practices of Modern Coal Mining , New Age International Pvt.Ltd., New Delhi.
6. Dr S.M.Kole, Khuli Khan Ka Ayojan, CMPDIL Publication (in Hindi)

Reference

1. Universal Mining School, Cardiff

Diploma (Engg.)
Mining Engineering
Semester-III

MINE DEVELOPMENT- DRILLING & BLASTING

Unit-I

General concepts of Mine Development (entry to the deposit both shallow and deep seated)
Drills & Drilling for quarrying, opencast and underground mining (coal and non-coal) : Types of drills, drilling accessories, drillability of rocks, managing drilling in production mines, dust control during drilling etc.

Unit-II : Explosives

Definations of explosives, constituents of explosives,
Magazine - layout, construction & safety features.- Handling of explosives.
Classification of explosives (i) Low & High Explosives (ii) Permitted & Non permitted explosives.
Detonators & Accessories(i) Different types of detonators, advantage of delay detonators. (ii) Safety fuse, detonating fuse.(iii) Simultaneous and delay action firing, (iv) Shock tubes, (v) Electronic delay detonators.
Exploders: Different types, construction and safety features of exploders.
Common causes of accidents from explosives, Misfired shots, blown through & blown out shots, causes & Dangers, remedial measures required. Relevant provisions of Coal / Metaliferous Mines.
Alternative to explosives - Cordex, Hydrox, Hydraulic Splitter, Hydraulic Breaker (Primary & secondary), Armstrong air breaker, their advantages & disadvantages.

Unit- III : **Blasting practices in Mines**

Shot-firing tools
Preparation of charge
Procedure for firing shots,
Direct & Indirect initiation, stemming material, water ampules, cushion firing
Blasting efficiency, - consideration of factors
Calculation of explosive quantity, powder factor, detonator factor, Solid blasting : Blasting of solids, advantages and disadvantages, precautions and restrictions, pattern of shot holes

Unit- IV: Surface Mine Blasting

Factors affecting blast design, selection of various blast parameters, Burden, Spacing, Stemming distance, Sub grade drilling, depth of hole, bench height, diameter of hole,
Different types of explosives used in o/c mines, ANFO, Cartridges (Slurries & Emulsion), Site Mixed Slurry/Emulsion Explosives (or Bulk Explosives)
Deck charging and column loading, calculation of charge per hole and powder factor, controlled blasting, special blasting technique.
Secondary blasting – Pop shooting and Plaster shooting
Underground Blasting : Various cuts, Burden, spacing, depth of hole, stemming of hole, precaution during blasting. Solid blasting practice

Unit-V : Rock Fragmentation

Mechanism of rock fragmentation,
Factors affecting rock fragmentation,
Techniques to improve rock fragmentation

Environmental impact of blasting:

Back break, over break, fly rock, blast induced vibration. fumes etc.
Ground vibration measurement of other parameters,
Prediction & control measures to reduce/check - air blast, noise

Text Books

1. D.J.Deshmukh, Elements oif Mining Technology, Vol. I, Denett & Co., Nagpur
2. B.V. Gokhale, Blasthole drilling Technology, MultiFields, Bombay
3. Dr G..K.Pradhan, Explosives & Blasting Techniques, Mintech Publications, Bhubaneswar.
4. Dr.Sushil Bhandari, Engineering Rock Blasting Operations. Pub: A.A.Balkema Publisher Old post Road, Brook field, TO5036, USA.
5. Dr S.K.Das, Explosive & Blasting Practices in Mines, Lovely Prakashan, Dhanbad.
6. Explosive manufacturers' technical literature
7. K.A.Pant, Visfotak - Ek Parichay, Anamika Publishers, (in Hindi)
8. DGMS Circulars

Diploma (Engg.)
Mining Engineering
Semester-III
MINING GEOLOGY-I

Unit-I : General Geology

Branches; Allied (ex. Geophysics, Geochemistry, etc) ; Scope of Geology; Origin of Earth- various hypothesis. Age of earth - Various methods of age determinations, radioactive methods and their advantages. Interior of Earth crust, mantle and core. Continental drift Isostacy.

Unit-II : Physical Geology

Erosion & weathering - Erosion, Transport and Deposition Vent facts, Pedestal rocks, sand dunes, and loess. Weathering: Physical Weathering and chemical Weathering. Exfoliation and spheroidal weathering**.**

River & wind erosion- Erosion, transport and deposition, water falls, meanders, oxbow lakes, alluvial fans, flood plains, delta.

Work of Wind: Erosion, Transport and Deposition Vent facts, Pedestal rocks, sand dunes, and loess.

Earth quake - seismographs, Earthquake waves, Classification of earthquakes, Elastic rebound theory, Richter scale of earthquake intensity, Distribution of Earthquakes.

Volcano - Types of volcanoes, volcanic products volcanic cones, Distribution of volcanoes.

Unit-III : Mineralogy

Definition, Physical Properties of minerals colour, Streak, Lustur, Hardness, Habit, Cleavage, Fracture.

Identification of common minerals Orthoclase, Plagioclase, Augite, Hornblende, Biotite, Muscovite, Olivine, Quartz Asbestos, Calcite, dolomite, corundum, Gypsum Talc.

Unit-IV : Petrology

Rock cycle and characteristics of various Rock types Igneous Rocks – acid and basic rocks. Texture of Igneous rocks- Glassy, vesicular, Porphyritic, Coarse Grained, medium grained, fine grained, and cryptocrystalline. Classification- Plutonic, Hypobyssal and Volcanic rocks. Tabular Classification

Sedimentary Rocks - Definition, Classification-Mechanically formed, Organically formed and chemically formed rocks, Sedimentary Structures; Stratification, Lamination Graded bedding, Current bedding and ripple marks. Common sedimentary rocks-Conglomerate sandstone, Shale, minestone and breccias.

Metamorphic Rocks - Definition; Agents of Metamorphism- Heat, Uniform pressure, directed pressure. Chemically active fluids and gases. Structures and textures of metamorphic rocks-slaty, Schistose, Gneissose, and Granulose. Common metamorphic rocks-slaty Schist, Gneiss, Quartzite, and marble .

Unit-V : Structural Geology

Strike & Dip: Apparent Dip, True Dip,

Folds- Elements of Folds, anticline and syncline, limbs, axial plane, Axis of fold. Types of fold- symmetrical, Asymmetrical, Overturned, recumbent, Isoclinal, Plunging folds ,Anticlinorium, Synclinorium ,Open fold, close fold, Dome and Basin.

Faults- Fault Terminology, Fault-plane, Hade, Dip and strike, throw, Heave, Slip, Hanging wall and foot-wall. Classification of faults-normal and reverse faults, Dip fault, strike-fault and oblique-faults, High and low angle faults, parallel faults, step-faults, Graben, Horst, Radial faults, Peripheral faults.

Unconformity- Definition, Types-Angular unconformity, Disconformity, Nonconformity.
Joints and cleavages- Classification- Strike Joints, dip Joints oblique Joints, bedding Joints, master Joints, sheet Joints and Columnar Joints. Outlier and Inlier.

FOSSILS Fossils: Definition, mode of occurrence, uses of fossils.

Text Books:

1. Introduction to Geology : G.B.Mahapatra
2. A Text Book of Geology : P.K. Mukherjee
3. Engineering And General Geology : Parbin Singh
4. Physical And Engineering Geology : S.K. Garg

Reference Books:

1. Structural Geology : M.P. Billings
2. Geological Maps : G.W. Chiplonkar
3. Rutley's Elements of Mineralogy : H.H. Read
5. Principles Of Petrolog y : G.W. Tyrell
4. Applied Geology : S. Banger
5. Applied Geology : D.V. Reddy
6. Engineering Geology : D.V. Reddy
7. Geology of India (Vol I&II) : R. Vaidyanadhan & M. Ramakrishnan

Diploma (Engg.)
Mining Engineering
Semester-III
MINE ENVIRONMENTAL ENGG.

Unit I
Definition, scope and importance, need for public awareness, Natural resources and associated problem. Forest resources: Use and over- exploitation, mining dams and their effects on forest. Water resources: Use and over-utilization of surface and ground water, floods, drought conflicts over water, dams-benefits and problems. Land resources: Land as a resource, land degradation, Soil erosion and desertification.

Unit II
Definition: Cause, effects and control measures of: air pollution, Water Pollution, Marine Pollution, Noise Pollution, Thermal pollution, nuclear hazards, and Solid waste management: Cause, affects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution Case studies, Disaster management: floods, earthquake, cyclone and landslides.

Unit III : Mine Atmosphere
Pollution of mine atmosphere; Mine gases.(CO, Methane); Origin and occurrence of mine gases. Heat and humidity in mine atmosphere and their effects; Cooling power of mine air

Unit IV : Mine Ventilation system & Natural Ventilation
Object and standard of ventilation; Degree of gassiness of mines, composition of mine air; Measurement of air quantity, pressure and velocity; Law of air flow in mines, flow of air in ducts and mine roadways, resistance of air ways, Chezy's and Atkinson's equations; Equivalent resistance and equivalent orifice of mine; Regulations related with above topics, ecological and environmental laws related to mines.
Dust monitoring; Mechanical ventilation, different types of fans used in mines, theoretical characteristics of centrifugal and axial flow fans, forcing and exhaust fans, relations between pressure quantity and power of fan, numerical calculation, fan drift, their constructional feature, auxiliary and booster fans, constructional feature, splitting of air current, advantage of splitting, reversal of air current
Natural ventilation and its measurements; Thermodynamics of natural ventilation, Distribution and control of air current; Accessories of ventilation used in mines – Door, regulator, stoppings, air lock, air crossing, brattice

Unit V : Mine Illumination/Lighting
Lighting sources in mines, cap lamps, constructional feature of lamps; Underground lighting Flameproof and intrinsically safe lighting; Lamp room layout, lamp room organization, care and maintenance of cap lamps; Lighting in opencast mines exactly as per statuary norms.

Text Books

1. Elements of Mining Technology Vol.2, D.J.Deshmukh
2. Mine Ventilation by Prof. S.P.Banerjee
3. Mine Ventilation by Prof G.B.Mishra
4. Paryavaran Addhyan: KL Tiwari and Jadhav
5. Standard of Lighting Circular. issued by DGMS

Diploma (Engg.)
Mining Engineering
Semester-III
MINE SURVEYING- I

Unit I : **Chain Survey**
Linear Measurements; Types of chains; Tapes; Errors in chaining and corrections in linear measurements; Direct and indirect Ranging; Principles of chain surveying. Offsets, Limiting length of offsets; Booking field notes; Obstacles in chaining; Instruments for setting out right angles.electronic distance measurement, total station.

Unit II : **Theodolite-I**
PARTS - Terms used - Temporary adjustments - Tachometers.Measurements - such as ranging, stablishing new station,horizontal angle, vertical angle, bearings, permanent adjustment.
Theodolite-II
Purpose of traversing first, second and third order traverse, closed closed and open traverse. Included and direct angles, Latitude, Departures, checks-corrections of the traverse- Bowdith rule and transit rule.

Unit III: **Dial Survey**
Miners dial- Dial and telescopic - Minersdial construction -temporary and permanent adjustment.Booking
survey –Graphic Method. - Field & line Method.Setting out underground road ways with the help of dial,Plotting by protactor, Test for Minersdial, precautions to be taken. Methods used in dial surveying-Loose needle survey-Fast needle survey.

Unit IV: **Use of level in underground mines**
Measuring the depth of shaft and other working, underground bench mark - Datum - determining throw of fault - gradient of underground road. - Measuring subsidence.

Unit V : **Dip strike problems**
Determining the true and apparent dip and strike from bore hole data, Determining the deviation in the borehole drilling - Determining the throw of fault and length of drift to cross the fault, Finding out the bearings and dip of various mine working.

Text Books

1. Mine Surveying by S. Ghatak
2. Surveying & Levelling by B. C. Punamia
3.Surveying & Levelling by Kanetkar & Kulkarni

SSD- CSEP (Communication skills Enhancement Program)

3rd Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/B.Sc. (IT)/Diploma (Engg.)

CSEP PROGRAM: This programme is devised to give you all an exposure to the language used in various communication activities. The objective of the programme is to enhance our communication skills. Research says that the more you listen and speak a language the faster you learn. In these sessions, we are going to practice to speak sentences and words used in different situations. Once you have the command on the language, you can use it for any context; be it interviews, presentations, business, technology so on and so forth.

Learning through activities is more effective than learning through lectures and books. We are going to provide you with opportunities to make speeches, presentations, interact with various people etc.

Unit-1

Thematic structure: Money, Cricket, A trip to Gizmo world, Culture and Shopping

Assignment: Progress Test-1

Unit-2

Thematic structure: Festivals, Computers, Auto mania, Environment and studying abroad.

Assignment: Progress Test-2

Unit-3

Thematic structure: Internet, Fashion & Style, Globalization, all about jobs and Trends in Technology.

Assignment: Progress Test-3

Unit-4

Conversation Questions: College, Beauty and Physical attractiveness, Food and eating, Entertainment, Advertising, Films in your own language, Books & reading.

Activities: Reading newspaper and news analysis, Role plays, Extempore, JAM, Story creation, Picture description, Group Discussion and celebrity Interview.

Assignment: Post assessment Test

GEOLOGY I : PRACTICAL/LAB

LABORATORY EXPERIMENTS

1. Study of Physical Properties of Minerals
2. Determining the Specific Gravity of Minerals by various methods
3. Megascopic studies of igneous Rocks with Tabular Classification
4. Megascopic studies of sedimentary Rocks with Tabular Clasification
5. Megascopic studies of Metamorphic Rocks
6. Study and Identification of important Rock forming Minerals in Hand Specimen
7. Study and Identification of important Economic Minerals in Hand Specimen
8. Study and Sketch of Model showing different types of Faults, Folds and their relations to photography.

MINING I (Introduction to Mining) : PRACTICAL/ LABORATORY

LABORATORY EXPERIMENTS

1. Study of accessories of boring machines and boring rig.
2. Study, sketch & use of the boring and fishing tools.
3. Study and sketch of Hydraulic feed mechanism of the drilling machine.
4. Study and sketch of double tube core barrel
5. Study and sketch of various types of detonators and relay
6. Study of different types of exploders
7. Study of construction and use of stemming rods, scraper cum break detector, blasting cable, circuit tester etc
8. Study and sketch of approved types of explosive magazines
9. Study & sketch of different types of initiation
10. Study & sketch of Hydraulic Splitter / Cordex.

These items as stated in Sl. No. 1 to 10 will be physically shown to the students in batches at the nearby mines. The Mine visit report will be part of the Practical Report Writing. Figures/pictures will be necessary to explain few critical items.

MINE SURVEYING-I PRACTICAL - 1

LABORATORY EXPERIENCES

1. Theodolite traverse survey.
2. Method of co-ordinates.
3. Close traversing by Theodolite & balansing by Bowdith rule & transit rule.
4. Study of Miners Dial its constructional features & adjustments
5. Study of measurment of Depth of a vertical shaft.
6. Study of measuring subsidence.
7. Determine the true apparent dip & strike from bore hole data.

A. Practices and projects in the field for

-Chain and tape survey
-Chain and compass survey
-Leveling survey
-Plain table survey
-Use of theodolite in traverse and tachemetry
-Use of Total Station

B. For all Projects, there is compulsion in presence for Students

-Filling of appropriate tables
-Calculations,
-Finding errors
-Error resolving using
Graphical and Analytical methods
-Preparation of drawing
-Presentation
-Binding of all sheets

Efforts will be made to demonstrate the field use of surveying instruments in nearby mines.

Diploma (Engg.)
Mining Engineering
Semester-IV

METHOD OF WORK (COAL)

Unit I: Board and pillar method – Development

Board & pillar system – Applicabilities – Merits – Demerits – Different terms – stages of development – depillaring stages – Applicability of panel system – types of panels – factors influencing the size of panel system – general considerations – factors influencing the No. of openings of panel – merits and demerits of panel system – factors governing the selection of development method – factors governed while opening of a district – Panel development with three headings and – Different methods of development systems along dip, along strike, crosscuts, steeply dipping seams, loaders, belt conveyer load haul dumpers, belt conveyers chain conveyors. Road headers – arrangements for ventilation.

Unit II : Board and Pillar method– Depillaring

Important terms – classification – planning preparation arrangements – sequence of operations – Pillar extraction under weak roof condition – mechanised method of Pillar extraction by LHDS, SDL, scraper chain, conveyor systems – size, shape of pillars, ribs - local fall main fall – air blast, dangers, precautions – method of stowing conditions required for adopting stowing – preparation arrangement for stowing – lay out of panel with stowing – danger and precautions while working below goaved areas – contiguous seams extraction – precautions against fire during and after depillaring.

Unit III: Long Wall Advancing Method

Long wall – Related Terms –Applicabilities, merits, demerits, limitations, classification long wall advancing indicating its applicabilities- comparison between Long wall advancing and Long wall retreating- development of gate roads- machinery employed on a mechanised Long wall face- continuous mining method- different factors governing the length of Long wall face- lay outs of mechanised long wall face advancing with caving- layout of mechanised long wall face advancing with stowing.

Unit IV: Long Wall Retreating Method

Long wall retreating and its applicabilities- layout of mechanised long wall face retreating with stowing- layout of mechanised long wall face retreating with caving- lay out of long wall face equipped with shearer- single unit and double unit layouts- cutting methods of the Shearer in longwall mining- methods of sumping in long wall face extraction- method of push- sumping in longwall face extraction.

Unit V: Thick seam working

Thick seam Working and associated difficulties different methods and applicabilities - inclined slicing with caving/stowing - Horizontal slicing with caving / stowing - Blasting gallery method- sub level caving with mechanised longwall - Horizon mining - merits - demerits - Applicabilities limitation of demerits.

Unit VI: Modern methods

Applicable condition of a plough, method of working by plough, unidirectional ploughing method, bi-directional ploughing method, overpassing, hydraulic mining, merits and demerits, applicable conditions of underground gasification of coal. Merits, demerits of gasification of coal, method of extraction of gasification and contiguous seam

REFERENCE BOOKS

1.	Elements of Mining Technology Vol.I	:	D.J.Deshmukh
2.	Wining and working coal	:	R.T. Deshmukh & D.J. Deshmukh, Vol. 1& 2
3.	Longwall Mining	:	Samir Kumar Das
4.	Modern coal Mining Technology	:	Samir Kumar Das
5.	Principle &Practices of Coal Mining	;	R.D. Singh
6.	Coal Mining practice	:	Stathum
7.	Surface Mining Technology	:	Samir Kumar Das.
8.	Surface Mining	:	T.N.Singh

COURSE CONTENTS OF PRACTICALS:

1.0 Know the Drawing of layouts of under ground mine

Draw a pit-top & pit Bottom layouts of shaft- layout of Board and pillar showing development work and ventilation network, transport network- layout of Board and pillar showing method depillaring and ventilation network, transport network- layout of longwall mining method locate important areas of working and ventilation network and transportation network- layout of BG panel.

2.0 Know the calculation of output for under ground mine

Calculate out put for 3 heading, 5 heading faces-Calculate percentage of extraction for Bord and pillar development work assuming the gallery dimensions-Calculate the percentage of extraction for depillaring work-Calculate the percentage of extraction in longwall mining method.-Calculate percentage of extraction in Blasting Gallery method - Calculation of Quantity of Explosive require for given out put with reference Bord & Pillar and Blasting Gallery Method.

3.0 Know the organisations charts.

Draw the Organisations chart for a large Underground Mine-Organisations chart of a Mining Industry.

4.0. Know the method of drawing layouts with Auto Cad

Draw the following plans-a) District ventilation plan b) District working plan c) Pit top and pit bottom layouts

Diploma (Engg.)

Mining Engineering
Semester-IV
SURFACE MINING

Unit I : Different basic concepts about surface mining

Define the term surface mining - basic concepts, applicability, advantages and disadvantages; systems – classification, applicability, advantages and disadvantages.

List the different forms of surface mining, Define the following terms related to surface mining with comprehensive sketches--Outcrop, overburden, face, bench, floor of bench, depth of hole, spacing burden, toe, crust, back break, angle of repose, , stripping ratio, economic cut of value, quarriable limit, placer mining, alluvial Mining, strip mining, slope stability, back filling. Subgrade drilling,

List the major surface coal mines in India, surface metal mines in India.

Opening up of deposits: Box cut – objective, types, parameters, methods; Factors affecting selection of box cut site; Production benches – formation, parameters and factors affecting their selection. Statutory provisions for benches, Ramp design. Overcasting, side casting, Pit top and pit bottom layouts, Quality control, Haul Road- design & maintenance, sub grade soil stabilization, width of roadways for various size of dumpers, contact pressures, Culverts, Dump design

Unit II : Drilling and blasting techniques in surface mines

Classification of the drill holes, based on depth, diameter and Pattern.

Applications of vertical and inclined drilling.

Merits and demerits of vertical and inclined drilling .

Different parameters connected to drilling of blast holes.

Patterns of drill holes employed.

Process of blasting, Explosives, Blast design, Bench blasting pattern, Delay blasting (classification), NONEL/Shock tube blasting, Electronic delay use in Indian mines, Powder factor, Calculating explosive requirement in blasting, Problems in blasting, Ground vibration, DGMS norms for blast vibrations, noise, Fly rocks, blasting in hot holes. Explosive van, bulk explosives, ANFO use mechanically, Handling of misfires etc.

Different patterns of drill holes employed in mines above.

Blasting tools used in open cast mines.

Explain the drilling, charging, methods of giving connection and firing procedure in open cast mines.

Deck charging or loading and its applicability.

Controlled blasting techniques (muffled blasting and cushion blasting) and their applicability

Secondary Blasting, methods of secondary blasting pop shooting, mud capping and snake holing and their applicability.

List the danger due to blasting practices.

List the preventive measures due to blasting practice in open cast mines.

Unit III: Different Mining machinery (HEMM) employed in surface Mining

Machinery for preparing the ground for mining operation, such as dozer, scraper, road grader, road roller, cranes,

Main parts & function of and the place application of Dozer.

Main parts, functions, and place of application of road scrapers.

Main parts, functions, and place of application of road graders.

Main parts, functions, and place of application of excavators/shovels.

Main parts, State the function ,and place application of Dumper.

Main parts, functions, and place of application of drag lines, BWE, Continuous mining systems (Surface Miner, Highwall mining).

Mof working of in-pit crushing technology with case study

Applicable conditions, merits and demerits of in-pit crushing technology

Applications of GPS in opencast mining.

Unit IV: Various aspects of surface mining

Slope stability, angle of repose, highwall slope, slope failures (different types), measures to be taken against slope failures, pumping & drainage system, acidic mine drainage, slope mass rating, different techniques and statistical methods

Unit V : Concepts of Environment & Ecology related to surface mining.

Definition of the term Environment - Ecology with particular reference to mining - Relationship between Environment & Ecology

Problems of Environmental and Ecology as a result of mining operations.

Remedial measures of the environmental problems met with in mining. Plantation, Reclamation, Waste disposal etc.

Necessity of Environment Management Plan - Essential features of EMP.

Text Books:

1. A Handbook on Surface Mining Technology : Dr. Samir K Das, Sagardeep Prakashan, Kharagpur
2. Surface Mining : G.B. Misra
3. Mining Machinery : Dr. Khanindra Pathak, Cygnus publisher, 55B Mirza Galib Street, 8th Floor, Saberwal house, Kolkata.
4. Surface Mining : T N Singh, Lovely Prakashan, Dhanbad
5. Advanced Surface Mining : G.K.Pradhan & Manoj Pradhan, MINTECH Publications, Bhubaneswar

Reference Books:

1. Surface Mining: Pfleider
2. Mining Equipment : Boki
3. SME handbook: Hartman
4. Surface mining equipment: Martin

Diploma (Engg.)
Mining Engineering
Semester-IV

MINING LEGISLATION AND GENERAL SAFETY

Unit I: Mines Act 1952

Meaning of the terms, Mine Act, Regulations, Rules, Bye-laws, standing orders, and situations under which act does not apply. Provisions of Mines Act in respect of Drinking water health and hygicive conservancy, Medical Appliances, Hour and limitations of Employment - Leave with wages.

Unit II : Mines Rules 1955

Mine Rules related to drinking water, lavatories, urinals with on surface and in underground first aid, - Ambulance, Hours, and limitations of Employment - leave with wages - with wages and over time.

Unit III: Coal Mines and Metalliferrous Mines Regulations

Important definitions, regulations related to notice of accidents duties of managers, Asst/under Managers, Overman, foreman and surveyor, Mine plans and sections. Means of Access and egress ladder and Ladder ways under M.M.R. Transport of men and material by Haulage mine working precautions against dangers from gas and water Mine ventilation, mine lighting and safety equipment and types of fences(Miscellaneous)

Unit IV: Safety Aspects in Mines

Accidents classification and analysis-safe condition- unsafe condition- mine safety- safety objectives- major factors to be considered for safety - safety week- pit safety committee- safety organisation and safety policy.

REFERENCE BOOKS

1. Mine Management, Legislation and Ground safety : S.Ghattak.
2. Mine Management : V.N.Singh
3. Mines act 1952
4. Mines rules 1955
5. CMR/MMR 1957 / 61
6. Critical Appraisal : Rakesh & Prasad
7. DGMS Circulars

Diploma (Engg.)
Mining Engineering
Semester-IV
Mine Environment II

Unit I : Mine fires
Classification, causes, preventive measure, spontaneous heating- causes and preventive measures. 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/C_2 deficiency rations, reopening of sealed off areas Fire fighting equipment and organisation

Unit II : Mine Explosions
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.

Unit III : Rescue and Recovery
Rescue and Recovery operations, operations in mines, objectives and classification of rescue apparatus. Self contained (Compressed Oxygen) breathing apparatus. Smoke helmet-constructional details, Gas mask, Self rescuer, purpose of resuscitations apparatus, tests before and after using rescue apparatus, Rescue stations-equipment required, Rescue Organisation-Construction and function.

Unit IV : Mine Inundation
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.

Unit V : Gas Detectors
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.

Unit VI: Miners Diseases
Different types of miner's diseases, diseases due to inhalation of dust in mines causes and preventive measures of pneumoconiosis silicosis, siderosis, manages poisoning, lead poisoning, Chromium poisoning. Harmful effects of ration active minerals- causes and preventive measures of nystagmus and Anky-lostomiosias

Unit VII : Continuous Monitoring of Ventilation System
Continuous recording and monitoring of Air velocity and Quantity-Tele monitoring systems – Advantages – disadvantages of it.

REFERENCE BOOKS

1. Mine fires, Rescue, Recovery and Inundation M A. Ramulu
2. Mine ventilation S. Ghatak
3. Mines Rescue rules
4. Mine ventilation Hartmen
5. Mine ventilation G.B. Mishra
6. UMS Volumes
7. Statham series
8. Mine management, Legislation and General safety S.Ghatak
9. Mine environment and its control G B Mishra
10. Mine Management VN.Singh
11. Industrial Management O.P.Khanna
12.SME Mining Engineering Hand Book-vol –I & vol-II

MINE ENVIRONMENT PRACTICALS

- **Flame Safety Lamp and Gas Detectors**

Identifies the parts of flame safety lamp-Dissembles and assembles the flame safety lamp-Tests for the presence of inflammable gas accumulation and percentage of tests- size and shape of the gas caps with varying percentages of inflammable gas- different types of flame safety lamps -Determination the percentage of methane using methanometers-Determines the percentage of CO using Co Detectors (chemicals)- Determination the percentage of other gases using multi-gas detectors

- **Studies the comprehensive model showing the coursing of air ventilation with various devices**

Ventilation devices-Draws the performance/characteristic curves of mine fans from the observations made by conducting appropriate experiments- ventilation survey for quantity of air using ainmometer, velometer, smoke test, pitot tube- ventilation survey for pressure using inclined manometer-Determination of the ventilation efficiency quotient (VEQ)- The qualitative survey for determining the temperature, relative humidity and cooling power of air- ventilation plan

- **Various Fire Fighting Equipments**

Study and sketch fire fighting equipments for class A, B,C, D, E Fires.

- **Various Rescue and Reviving apparatus used in Mines**

Know about various rescue and reviving apparatus- self contained breathing apparatus- gas mark- self rescuer used in minus- dragger pulmotor reviving apparatus.

- **Collection and Analysis of Mine Air Samples**

Collection of mine air sample from different parts of the mine by using water displacement methods, pipette and aspirator and vacuum bottles-Analysis of the air samples for the presence of various noxious gases- Graphs from results of the analysis of mine air samples from behind the sealed off areas of CO wards diagram.

- **Collection and Analysis of Coal Dust Samples**

Collects coal dust samples-Reduces the dust samples to the required quantity for analysis-Draws the inferences from results of the analysis with regards to the proneness of in flammability of coal dust-Types of German and Polish dust barriers. Develops the skills to use the equipment /devices/models charges relating to the mine ventilation system.

Diploma (Engg.)
Mining Engineering
Semester-IV

MINING GEOLOGY-II

Unit I : Stratigraphy

Definition –objectives of Stratigraphy – Geological time scale – Physical divisions of India major Stratigraphical divisions of India – Archons, Dharwar, Cuddapah – Vindyan – Gondwana systems – Stratigraphy of A.P.

Unit II : Economic Geology

Definition of forms – Ore –Gangue, Tenor, associated mineral resources, proved – probable, possible reserves – different process of Mineralization – important Economic minerals.

Unit III : Prospecting Techniques

Objectives – Guide lines for location of mineral deposits – prospecting methods principles – Applicability's of pitting, trenching, Drill cutting, Boring, Geophysical methods–Electrical, gravity, Seismic, Radiometric, G I S and Remote Sensing.

Unit IV : **Know about the coal geology**

Objectives - State the Periods of coal Formation- Mention the different Stages of Coal formation- Explain the Origin of Coal Seams-Explain the In situ Theory-Explain the Drift Theory- Describe the Structural Features of Coal Seams-Give the Classification of Coal- Name the world coal fields-Describe the coalfields of India

Unit V : **Know about the Petroleum Geology**

Know the importance of Petroleum as Fuel- State the Origin of Petroleum-State the Migration and Accumulation of Petroleum-State the distribution of Oil fields in the world- State the distribution of Oil fields in India

REFERENCE BOOKS

1. Text Book of Geology	;	P.K.Mukharjee
2. Mining Geology	:	Arogya Swami
3. Engineering Geology	:	Parbin Singh
4. Text Book of Coal Geology	:	R.S. Sharma

GEOLOGY II PRACTICALS

- **Megascopic identification of minerals and rocks**.
  Identifies the tools and equipment required for megascopic identification of Minerals and rocks and Know to use them. Streak plate, Glass Knife - Moh's Hardness scale - Jolly's spring Balance - magnifying glass-Identifies the minerals of silicate group of minerals by the megascopic study of their properties. Identifies the rocks of all families by the megascopic study of their properties
- *Microscopic identification of minerals and rocks*

Identifies the different parts of petrological microscope and develops skill to use the same Identifies minerals by study under Microscope- Identifies the rocks by study under Microscope-Give the topography and contours, maps the structural deposit/bedding. Finds out strike and Dip of the structure deposit

- **Mapping**
  Drawing of profiles-Preparation of Maps showing different geological features such as Folds, Faults, Unconformities, Dykes and Sills-Understanding the geological-History of the area based on maps.
- **Undertakes field activities in Geology Camp**
  Identifies the tools equipment used in field activities- makes search for and identifies and collects the important minerals or rocks in the field study of a given area-Determines strike and dip of given bedding with the help of Brunton compass-Identifies in the field-Fold and its parts, Fault and its parts, Joint and its parts, Unconformities, Identifies different structures-Current bedding, Inliers, Outliners, Exfoliation, Ripple marks

Note: 25 marks out of 100 are allotted to mine visits (3 mines) and associated field activities.

SSD- CPP (Campus Placement Program)

4th Semester

B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/Diploma (Engg.)

Introduction to CPP Program: 'Soft skills' are a framework of desirable qualities which gives a candidate an edge over his peers during the selection process of a company. We, at AKS University, have designed the Campus Placement Program (CPP) to help out our students who are sitting for their placement process in various Companies.

Teaching methods: The teaching methods in CPP training includes lectures, projects, role plays, quizzes, and various other participatory sessions. The emphasis will be on learning by doing. Since the method of training is experiential and highly interactive, the students imbibe the skills and attributes in a gradual and subtle way over the duration of the program. The students will not only learn the skills and attributes but also internalize them over a period of time.

Objective of the Program:

- Develop effective communication and Presentation skills.
- Develop all-round personality with a mature outlook to function effectively in different circumstances.
- Understand the skills tested and participate effectively in Group Discussion.
- Take part effectively in various selection procedures adopted by the recruiters.
- Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.

UNIT-1

Soft skills – a general overview, Talking about Present, Past and Future, Describing Processes and operations, Expressing Opinion: Agreement & Disagreement, Special Expressions in English, Pronunciation and neutral accent,

UNIT-2

Introduction and definition of a GD, Purpose of a GD, Types and strategies in a GD, Do's and Don'ts in GD, Presentation skills: A presentation about the company will be made by the students throughout the Unit. Each and every student is required to go through at least 10 Companies Profile related to their domain expertise., Telephone etiquettes- Preparing for business calls/Making business calls/Telephonic phrases, Dining etiquettes, Email etiquettes

UNIT-3

Industry Expectations, SWOT & STAR, Self Discovery, Leap to success- 7 Orientations, Time Management, Team building & leadership, Goal Setting, Developing Positive Attitude, Organizing meetings, Anchoring in a formal setting.

UNIT-4

Resume writing: Concept and Practice, Body Language, Corporate Grooming Dressing.

Mastering Personal Interviews: Paper Interview, Personal Interview, FAQs, Interview Practice,

Domain Specific Interview Preparation, Peer review- Pair interview, Interview model (Vocabulary for an effective Interview).

Reference Books:

1.Peter, Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw Hill.
2. Singh, Prakash and Raman, Meenakshi. Business Communication. New Delhi: Oxford UP.
3. Bailey, Edward P. Writing and Speaking at Work: A Practical Guide for Business Communication.
4. Pease, Allan and Peas, Barbara. The Definitive Book of Body Language.
5. Sherfield, R. M. ; Montgomery, R.J. and Moody, P, G. (2010). Developing Soft Skills. 4th ed. New Delhi: Pearson.
6. Johnson, D.W. (1997). Reaching out – Interpersonal Effectiveness and Self Actualization. 6th ed. Boston: Allyn and Bacon.
7. Jain, Alok, Pravin S.R. Bhatia & A.M.,Sheikh Professional Communication Skills. S.Chand.
8. Krishnaswami,N and Sriraman, T., Creative Englishfor Communication,Macmillan.
9. Mohan Krishna & Meera Banerji. Developing Communication Skills. Macmillan.
10. Robbins, S. P. and Hunsaker, Phillip, L" Training in Interpersonal skills"

PRACTICAL TRAINING AND ASSESSMENT

Periods Required :One and half month during semester break of IVth & Vth

OBJECTIVES:

After the completion of these topics the student should be able to

1. Study of History of Mine – Note name of the Owner, Agent, Manager, Safety Office
2. Study of Mine geological information
3. Study of Mine Plans and Sections
4. Study of Surface features related to Mine
5. Study of method of working
6. Study of method of blasting
7. Study of Transportation system and layouts
8. Study of Ventilation systems and layouts
9. Study of Drainage system
10. Study of Pit top and Pit bottom layouts.
11. Study of man Power plan
12. Develop the Lamp room layout and Magazine Layout
13. Draw the charts depicting instructional items related to Mining subjects

Note: Students will be sent for practical training to Coal/ Metal mines at the end of IVth & Vth year i.e. during summer vacation to different Mining industries. The training reports/records submitted by the students will be assessed at the end of Vth semester for award of marks.

Diploma (Engg.)
Mining Engineering
Semester-V

METAL MINING

Unit - I

Basic concept of Metal Mining and Development of Mineral Deposits Ore Mineral – Gangue – Hanging wall – foot wall – Ore pass – Ore bin – Ore chute Raise – winze – Comparison between coal, metal Mines.

Dividing mineral ore body – levels – formation of blocks -Shaft Station -Levels into sub levels - Winzes and raises - Positions of are drives – Footwall - Laying initial haulage – haulage inclines - Ore passes – ore bin –chutes - Handling waste rock - Hand drills and air legs – drifters and Jumbos – Tunnel Boring - Arrangements for loadings and hauling of broken rock speeding up of winzing. - Conventional and mechanised methods of raising, jora rise method.

Unit - II

Stoping Methods–Classification of stoping systems, Selecting stoping method Breast stoping, under hand stoping, overhand stoping, open stope stoping. Shrinkage stoping, sub level stoping, vertical crater retreating method. Sublevel slicing, Ring hole drilling, Caving methods.

Unit -III

Problems associated with Deep Mining- Deepening–difficulties associated remedial measures. Heat and humidity and dust in deep mines – working remedial measures.

Unit -IV

Sampling - Objectives and principles, mining situations – classification of sampling methods basing on collection. Stope sampling, channel sampling chip sampling, bulk sampling, drill sampling, Salting, Assaying and Assay plan

PRACTICAL

1. Study of different types of methods adopted in metal mines.
2. Study and draw sketch showing shaft fittings and shaft lay out.
3. Pit bottom and pit top layout around a vertical shaft and inclines.
4. Direct and endless rope haulage study.
5. Study and draw sketches of Breast stoping,
6. Study and draw sketches of under hand stoping,
7. Study and draw sketches of overhand stoping,
8. Study and draw sketches of open stope stoping.
9. Study and draw sketches of Shrinkage stoping,
10. Study and draw sketches of sub level stoping,
11. Study and draw sketches of vertical crater retreating method.
12. Study and draw sketches of Sublevel slicing,
13. Study and draw sketches of Ring hole drilling
14. Study and draw sketches of air-leg drill used in metal mines.
15. Study of block caving
16. Study & sketch of different sampling methods

REFERENCE BOOKS

1.	Elements of mining	:	LEWS
2.	S.M.E Hand Book Vol 1,2,3		
3.	Mining Engineers Hand Book	:	Peele. Vol 1,2
4.	Mining Geology	:	Arogyaswami
5.	Mine Ventilation	:	G.B.Mishra
6.	Rock Mechanics	:	B.S.Varma.

Diploma (Engg.)
Mining Engineering
Semester-V

MINING MACHINERY – I

Unit I:

Wire Ropes - Usage, chemical composition, infield tests of wire, classification of wire ropes, applicabilities of different ropes - causes of deterioration, precautions, selection parameters - computation of numerical problems on size - Weight and strength of wire ropes. Capping and recapping of wire ropes, classification - description of capping methods - splicing methods, description of splicing

Unit II:

Transportation in Mines -Rope Haulages - Purpose of transportation, comprehensive classification of transportation - ROPE HAULAGE - direct Rope Haulage System, merits, demerits and applications - safety Devices in Direct Rope Haulage system-Endless Rope Haulage System, merits, demerits and applicabilities safety devices - Laying and maintenance of track-constructional details of mine tub/car -factors of selection for rope haulage serial rope ways-computation problems for determination of H.P. rope size breaking strength, Tub capacity, number of tubs.

Unit III:

Transportation in Mines -Conveyors Conveyor usage, classification - belt conveyor system, different types of belt constructions, safety devices merits, demerits and limitations of Best conveying system - compilation of numerical problems to find the material quantity H.P. length and inclination of haulage, tensing strength breaking strength of belt amount of slip. Scraper chain convey or system, protective devices-merits, demerits and limitation. Transportation in Mines -Locomotives & Areal rope ways -Clarifies loco haulage systems, merits, demerits, applicabilities of different system – clarifies aerial roper ways, the applicable conditions of aerial ropeways.

Unit IV:

Introduction to Coal Processing/Beneficiation Machinery – why beneficiation-methods of beneficiation- quality control-material handling while beneficiation – crushing-screening-stacking-washing, Tailings dam-disposal of tailings – Coal washery & washing of coal etc.

TEXT & REFERENCE BOOKS

1.Handbook of Metalliferous Mining Methods by Y.P.,Chacharkar, Lovely Prakashan, Dhanbad.
2. Elements of Mining Technology, D.J.Deshmukh Vol.3
3. Mine Transport by Kerlin
4. Introduction to Mining, G.K.Pradhan, Mintech Publications, Bhubaneswar

Diploma (Engg.)
Mining Engineering
Semester-V
ADVANCED MINE SURVEYING

Unit I:

Theodolite:, magnetic bearing of lines. Traversing – continuous Azimuth, double fore sight methods – computation of bearings of traverses check of accuracy in angular measurements – permissible error – distribution – calculation of latitude and departure – problems on rectangular coordinates – calculation of areas – Bowditch Rule

Unit II:

Triangulation: Definition – Principles – classification mine Triangulation – scheme of Triangulation – Checks for measuring angles in Triangle – selection of stations – points considered for selection of stations – Baseline measurement in catenary, on level ground – Connections applied on base line determination of true north by astronomical observation method of extension of base line.

Unit III:

Setting Curves: Classification – Definitions – elements of simple curve – Method of setting out curves – by chord and offset, chard and angle.

Correlation survey - Purpose – methods of correlation – Direct Traversing – Co – planning – weisbach Triangle.

Unit IV:

Tachometry: Principles – systems – Constants Methods – Stadia method, subtence method, Tangential method – merits and demerits of Tachometry – relation between stadia reading, Horizontal distance, vertical distance, solves problems.

Unit V:

Stope Survey-Objectives – Methods – Tap Triangulation – Field of application – Typing method Radial Ray method – prepare stope sheets – stope plans with details

Modern surveying Instruments :- Principle of working of - EDM – GPS – Total station Instrument – applicability in Mines.

ADVANCED MINE SURVEYING PRACTICAL

1. **Know the traversing -** Conducts traverse survey by direct bearing method- traverse survey by double foresight method-Plot the traverse by meridian method and rectangular- other types of theodolites.
2. **Know the Triangulation -** Extension of the given base line.
3. **Know the Curve Setting -** Sets out curve by chord and offset-Sets out curve by Chord and Angle.

4. **Know the Tachometry survey -** Determines the tachometric constants- R.L of points by fixed hair method - R.L.s of points by tangential method.
5. **Plotting of various surveying field results -** Plotting of triangulation survey of the given area-Carry out profile levelling survey of the given area and plot its cross section-Carry out subsidence survey on a given area and plot the subsidence profile-Plot the contours of the given area.
6. **Study of the Modern Survey Equipment -** Principle of working of GPS Instrument and draw the diagram- Principle of working of EDM Instrument and draw the diagram- Principle of working of Total Station Instrument and draw the diagram-Carry out survey of a given area with Total station
7. **Survey Camp -** Correlation survey-Subsidence survey-Triangulation-Traversing-Determination gradient of a roadway-Setting out curves.

TEXT & REFERENCE BOOKS

1.Surveying : Kanetkar & Kulkarni Vol 1,2

2.Surveying Punmia Vol. 1,2,3

3.U.M.S. Volumes

4.Surveying : Ghatak Vol.1,2,3

Diploma (Engg.)
Mining Engineering
Semester-V

ROCK MECHANICS AND STRATA CONTROL

Unit I:

Introduction: Definition of rock mechanics – scope of Rock mechanics Application of Rock mechanics to mining field.

Unit II:

Ground Forces, Stress Analysis, Stress distribution in under ground: Various forces acting on block – types of Stress – Relation between vertical and lateral stresses – Stress field – Hydrostatic and Litho static stage of rock.Induced stresses due to Mining – Stress distribution around narrow and wide openings – Instruments used for measurement of stress – Stress distribution around road way.

Unit III:

Properties of rocks, rock indices, Classification of rocks and their failure: Rock properties – Physical Mechanical, properties of rocks – compressive strength – Tensile strength shear strength – strength indices of rocks – point load strength index protodyollous strength index – porosity – Anisotropy – methods determining shear strength.Definition of Rock man, Moh's scale of Hardening – classification of rock stability – theories of rock failure – Bumps – rock burst – theories of Bumps and rock bursts – Causes – Preventive measures.

Unit IV:

Strata and ground movements: Strata conditions before and after mining operations – Theories of mechanics of Strata behaviour – Strata pressure in and around Bord and pillar and long wall workings.

Subsidence: Definition of various terms – Angle of draw positive or negative, factors influencing angle of draw – factors affecting subsidence – damages – Protective measures – Subsidence measurements – Subsidence Survey methods – Objectives. surface Movements and Deformation during Longwall Mining

Unit V:

Strata control: Supports – Necessity – Materials used – Classification of supporting Systems – Applicabilities 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 – Fore pollary safari supporting- Junction Supports – Clearance of Heavy roof Collapse – Systematic Supporting – withdrawal of supports.

Practical

1. Procedure for the determination of compressive strength and point load index of given rock samples.
2. Measurement of Schmidt rebound hardness and its application.
3. Procedure for the determination of slake durability index of given rock samples.
4. Brazilian Test - determination of tensile strength of given rock samples of by
5. Procedure for the determination of shear strength and triaxial properties of rock
6. Measurement of core recovery and RQD.
7. Determination of RMR of given field data
8. Determination of Protodykonov Strength Index of given rocks

TEXT & REFERENCE BOOKS

1. Rock Mechanics, by Richard E. Goodman.
2. Rock mechanics and strata control, by B.S.Varma
3. Elements of Mining Technology, by D.J.Deshmukh & R.T.Deshmuk Vol 1,2,3
4. Wining and working Vol 1,2
5. Rock Mechanics & Ground Control, by D.Biswas, Lovely Prakashan, Dhanbad.
6. Rock Mechanics for Practicing Engineers, Eds: A.K.Verma, D.Dev & KUM Rao, Published by Deptt. Of Mining, IIT, Kharagpur.

Diploma (Engg.)
Mining Engineering
Semester-V
Mining Hazards & Safety I

Unit I: Mine Fires

Spontaneous Heating, Different stages: Determination of proneness of coal by crossing point, Factors governing proneness to spontaneous combustion, Detection of spontaneous heating symptoms, Preventive measures, Including pannel system layout, Adequate ventilation provisions in design stages, Regular inspections etc.

Unit II: Fires
Underground & quarry fires: Causes of mine fires, Dealing with mine fires, Sealing off, different types of stopping, construction & purposes, Pressure balancing to control air leakage into sealed off fire-areas, Methods of collection of air samples from sealed off fire - areas and from mine atmosphere, Recovery of sealed off mine working on account of fire by reopening.

Unit III Dealing With Fires In Quarry:
Debris, Coal pillars & coal stocks different types of fire extinguishers safety & statutory aspects.

Unit IV: Mine-Explosions:

Fire Damp Explosions:
Limits of inflammability & various factors influencing the same, Causes of fire damp explosions, Preventive measures.

Coal Dust Explosions Causes:
Factors affecting inflammability of coal dust, Causes of & preventive measures against coal dust explosions, Various stone dust, Types & efficiency, Stone dusting, Stone dust barriers water barriers & triggered barriers, Organization for stone dust treatment of coal dust, Sampling procedures of roadways mine dusts
apparatus & organization, Safety & statutory aspects.

Text & Reference Books:

1. Elements of Mining Technology Vol-2, D. J. Deshmukh
2 Mine Disasters and Mine Rescue – M.A. Ramlu, Oxford & IBH, New Delhi.
3. Hand book on First Aid, Published by Multi Disciplinary Centre on Safety, Health & Environment, Bhubaneswar
4 Mine Safety & Legislation, by S.K.Das, Lovely Prakashan, Dhanbad.
5 Mine Rescue Rules.

Diploma (Engg.)
Mining Engineering
Semester-V

MINE PLANNING AND DESIGN LABORATORY

COURSE CONTENTS

1.0 Know the Drawing of layouts of Open cast mine and blasting design & Auto Cad Practicing

Draw a layout for a surface mine with an out put 10,000 tonne/day in a flat deposit. -Draw a Layout for Mechanised opencast mine assume require condition data-Design of blasting sequence in surface mine.

2.0 Know the calculation of output for open cast mine

Calculation of No. of shovels, dumpers, drills require for given out put of-Calculation of bucket capacity of the shovel , drill capacity , capacity of the dumper for the above problem.

3.0 Design of Mine transport

Draw the transport layout of haul roads in a mechanised OCM-Draw the sketches of the following machinery a) Shovel b) Bucket wheel excavator c) Surface miner d) Dragline

4.0 Know the organisations charts for mine management.

Draw the Organisations charts for one Mechanized Open Cast Mine and one underground Coal Mine.

Diploma (Engg.)
Mining Engineering
Semester-VI
Mining Hazards & Safety II

Unit I: Mine Inundation:
Causes of inundation by surface & underground water both in opencast & underground mines.

Unit II : Preventive Measures:
Boundary Barriers, Panel barriers, Waterdams, Calculation of dam size & construction, Approaching water-logged workings, Precautions, Long - bore- hole patterns by burnside boring apparatus, Safety & statutory aspects.

Unit III: Mine Rescue & Recovery Work:
Search for survivors & their rescue, clearing dead bodies re-establishing systems connected with immediate rescue operation, What is Rescue & Recovery, Its scope,

Unit IV : Mine Rescue Organisation & Apparatus etc

Rescue organisation at coalfield & mine levels, Rescue stations, Rescue teams, Selection, Initial & refresher trainings, Rescue apparatus self contained portable breathing apparatus, Gasmasks, Smoke helmets, Self rescuers, Reviving apparatus, With actual rescue operations, Fresh air base & surface, Fresh, Air bases, Life lines & communication,

Unit V : Special Methods of Rescue & First Aid

Actual operations survival techniques use of bore holes in rescue operations. First Aid in Mining.

Practicals:
1. Study of constructional features & working of self contained breathing apparatus.
2. Study of various types of Fire Extinguishers used in Mines.
3. Study of constructional features & working of self Rescuer.
4. Study of constructional features & working of Gas Mask.
5. Study of constructional features & working of Reviving apparatus.
6. Study of working of Burn Side Safety Boring Machine.
7. Study of constructional features & working of Stone Dust Barriers.
8. . First aid training to be explained and conducted.

Text & Reference Books:
1. Elements of Mining Technology Vol-2, D. J. Deshmukh
2 Mine Disasters and Mine Rescue – M.A. Ramlu, Oxford & IBH, New Delhi.
3. Hand book on First Aid, Published by Multi Disciplinary Centre on Safety, Health & Environment, Bhubaneswar
4 Mine Safety & Legislation, by S.K.Das, Lovely Prakashan, Dhanbad.
5 Mine Rescue Rules.

Diploma (Engg.)
Mining Engineering
Semester-VI
MINE MANAGEMENT AND ENTREPRENEURSHIP

Unit I :Mine management

Role of mining Industry in country's economic development, ownerships of Industries, Management, organisation, in the context of mining Industry.

Unit II :Entrepreneurship

Motivating factors, Risks and Rewards, requirements self employment schemes, products selection. site solution, plant layout, setting of a mine, Market survey. Feasibility report, Man Power requirement, techno-economic and cost factors. **Work Study** - work study**,** principle of workstudy, scope and necessity of workstudy, Method study, advantages of Method study, time study ,principle of time study

Unit III : Industrial Dispute Act-1947

Industrial Dispute act-1947, causes f or Industrial Dispute adverse effects for Industrial Dispute various provisions of ID act works committee, conciliation officer, Bord of conciliation court of enquiry, industrial tribunal, voluntary organisation ,strike and lockout.

Unit IV :Total Quality and Management

Concepts of Quality and its use in mine production.

Text & Reference Books

1. Mine Management, Legislation and Ground safety :S.Ghatak.
2. Mine Management : V.N.Singh
3. Industrial Management : O.P.Khanna
4. Industrial Management : Jain and Bhanu
5. Mines act 1952
6. Mines rules 1955
7. CMR/MMR 1957 / 61
8. Critical Appraisal : Rakesh & Prasad
9. Mineral Economics : D.J.Deshmuk
10. Encyclopaedia of Mining Laws
11. Mine safety and disaster : C.P.Singh

Diploma (Engg.)
Mining Engineering
Semester-VI
Mine Electrical Engineering & Energy & Savings in mining

Unit I :
Surface Sub-Station: - Transmission lines from power company, their performances, Distribution on surface - General surface substation for underground mine/quarries. **Underground Power Installation:** - Distribution of power in quarries and mines - Underground distribution - Sub-station planning.

Unit II :

Mining Switch Gears: Gate and box - Pillar switch - Drill panel. **Mining Cables & Earthing Practice: -** Types of cables - Construction and applicability, safety features - Type of earthing used in mines **-** Main features, applicability and construction**.**

Unit III :
Miscellaneous: - Flame proof enclosure - Intrinsic safety - Symmetrical faults and circuit breaker equipment, Calculations - Principle of thyristors and their application to mines device - Load factor, diversity factor . **Indian Electricity Rules:-** Terms and definitions - Voltage limits, etc. Role of DGMS in electrical energy use in mines.

Unit IV : Energy Resources & Savings in mining – Energy – Types – Occurrences- Classification – Use – Use of Energy in Mining – Use of electrical en ergy in underground mines – Cost of energy in mining - Energy saving in mining and other areas- Energy Audit. Energy Conservation Act, Bureau of Energy Efficiency,

Text & Reference Books

1. UMS
2. Mine Electrical By N.K. Dutta
3. Practical Guide To Energy Conservation : PCRA Publication, New Delhi

Diploma (Engg.)
Mining Engineering
Semester-VI

MINING MACHINERY – II

Unit I :

Coal face machinery a) Hand held drills – classification Electronic Rotary drills: Hammer Drills, Epicyclical gear Arrangement-b) Power Loader – Types of loaders, field of applications, working operation-Principle, design and application of long wall face machinery shearer, AFC, Lump breaker – stage loader, power pack self advancing chock shield supports- SERDS and DERDS- their applications- principle of working of AFC (Armoured Face conveyor)- names the constituent parts of AFC-application of Twin Bord AFC, bottom closed AFC- safety devices associated with AFC drive- principle of lump breaker- purpose of power pack- Sequences of overburden Movements in a long wall Panel- classification and capability of the immediate roof in long wall panel- Abutment Pressures in long wall mining- classification of Powered supports in long wall mining- factors governing the selection of power supports- purpose of the following in Power supports

a) Canopy

b) Caving Shield

c) Lamniscate Links-

d) Extension Canopy

e) Face Guard

f) Double acting Advancing Ram- composition of Hydraulic fluid- types of Hydraulic control systems.

Unit II :

Flameproof and intrinsically safe apparatus- Outlines the necessity, FLP vs intrinsically safe apparatus field of application, Frame proofing – constructional features methods of intrinsic safety field or application Remote control principle. **Signalling**-Method of signalling in mines – electrical signalling, circuit indicators – Mining telephones operation.

Unit III :

Winding- Winding in shafts – purpose, equipment, Types of had gear frames –Shaft fittings – guides in the shafts – pit – top arrangement – keps and suspension gear – Types of drums. Head gear pulley, care skip winging-pit-top and pit-bottom arrangements – Drum winding and skip winding, multi-deck winding and friction winding – Drum and friction winding – Winding engine – depth indicator slow banking arrangement – Methods of speed control – Breaking in winding – Types of breaks.

Unit IV :

Mine Pumps: Pumping - Various terms of pumping, classification of pumps - centrifugal pump fittings - Turbine pump, fittings - Eudthrust - submersible pump - fittings Roto Pump, merits limitation - Selection of pumps - computation of numerical problems on Head, Quantity, H.P. Frictional losses.

Text & Reference Books

1. Elements of Mining : D.J.Deshmukh Vol.3
2. Science and Art of Mining Digest
3. U.M.S.Volumes
4. Statham series VOL III
5. Mine transport by : KERLIN
6 Introduction to mining engineering : HARTMEN

Diploma (Engg.)
Mining Engineering
Semester-VI
Mine Sampling Assaying and Mineral Processing

Unit I .
MINE SAMPLING: Definition, terms, purpose and various uses.Different Sampling Methods.Salting-purpose,safety against salting.Reduction of sampling- Methods used.

Unit II : ASSAYING: Introduction - assaymap, assay plan factor, assay values, grade value, tenar, type of grade value. Calculations based on average assay value. Estimation of ore reserves.

Unit III. MINERAL DRESSING: Scope, objectives & limitations of Mineral Dressing. Comminution. Size separation. Gravity concentration methods. Introductory froth floatation. Simplified flow sheets of coal, copper, Lead & zinc, iron, limestones (Briefly).

Unit IV : COAL PROCESSING/BENEFICIATION : Characteristics of Indian Coal, Why Coal processing is needed ? Constituents of coal and their role – Specificiation of coal to be used in steel plants (for coking coal) and other plants (power plants, cement plants etc), Coal quality improvement while mining, Coal handling, Dry coal beneficiation, Wet coal beneficiation,

PRACTICAL

1. Study of sampling methods.
2. Study of constructional features of jaw crusher.
3. Study of different types of tumbling mills.
4. Study of froth floatation.
5. Study of Gravity concentration methods.
6. Study of magnetic separation.
7. Study of various flow sheets.
8. Study of various coal processing methods (dry beneficiation)
9. Study of wet coal beneficiation process.

Reference Books:
1. Mineral dressing Gaudin
2. Mine economics Sinha & Sharma
3. Element of mining D.J.Deshmukh
4. U.M.S.
5. Mine economics A.Kumar

Diploma (Engg.)
Mining Engineering
Semester-VI
MINING MACHINERY PRACTICAL

1.0 Different cross sections of wire ropes and rope capping

Types of wire ropes types of core used in each wire- field application of each wire rope-Calculate bending factor, factor of safety of each wire rope-Sketch the different types of rope capping-Observe the condition under which each type of rope capping is used-Recapping and splicing of wire ropes

2.0 Various equipment used in rope haulage systems

The direct rope haulage system used in mines and observe the types of motor used, braking system present in it- endless rope haulage system used in mines and also sketch various attaching devices like small man clip-The Clifton pulley used in gravity haulage system- various safety devices used in haulage system.

2.0 Tensioning system in conveyor haulage

Sketch the Tensioning system used in conveyor-The various safety devices used in conveyor.

4.0 Different types of pumps used in mining, study the characteristics of pumps

Reciprocating pump and know about the method of starting and stopping of reciprocating pump- turbine pump and observe the functioning of balancing disk

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5.0 Salient features of drilling machine

Electrical coal drill used in mine- working of sun and planet gear used in coal drill
- different types of drill rods used in mining.

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6.0 Sylvester prop with drawer used in mines

Method of removal of props from goaf areas by using Sylvester prop with drawer.

7.0 Different types of road headers used in mines and salient features of DERDS

Principle of working of road headers-Draw the diagram of DOSCO road header used in mines-Principle of working of DERDS.

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Semester-VI

PROJECT WORK

COURSE CONTENTS

Identification of the Project- Collection of data- Organisation of the data- Design of Project elements - Preparation of drawings- Schedules and sequence of operations- Preparation of charts and models- Preparation of report

Note :

OBJECTIVES

- Identify different works to be carried out in the project.
- Collect data relevant to the project.
- Arrive at efficient method from the available choices based on preliminary investigation.
- Design the required elements of the project as per standard practices.
- Prepare working drawing for the project.
- Prepare schedule of time and sequence of operations.
- Prepare charts or models for each project.
- Prepare project report.

- Students shall be divided into groups of five and each group shall be assigned a problem that calls for application of the knowledge. Project work will be allotted by the concerned Head of Section and assign a staff member as guide at the beginning of VI semester. The students are exposed to the U/G workings or Industries for collecting information or relevant data from respective areas during the entire VI semester , to collect information after the institutional working hours or during holidays – second Saturdays / Sundays/ Winter/ holidays and prepares project report under the supervision of guide. Project report will be assessed at the end of VI Semester for final examination.

Project may be selected from among the following suggested topics

Underground mining(coal)
Bord and pillar mining method
Longwall mining method.
Blasting gallery method.
Stoping methods for non-coal mining
Mechanised stoping methods for non-coal mining

Opencast mining
Pillars extracting by open cast method(coal)
Mechanised opencast mining.
In Pit crushing technology
Surface mining technology
Blasting technology