

# **Faculty of Engineering & Technology**

Study and Evaluation Scheme

Of

**Diploma (Engineering)**

**Diploma (Mining Engineering)**

(Applicable w.e.f Academic Session 2015-18, 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.**

**Department of Mining Engineering,  
Faculty of Engineering & Technology,  
Diploma (Mining Engg.)  
(Session-2015)**

<b>Teaching and Examination Scheme Diploma-III</b>						
S. N.	Subject Code	Subject Name	L	T	P	Credit
1	10EE301	<b>Mine Electrical Engineering</b>	04			04
2	10GE302	Mining Geology-I	04			04
3	10MI303	Mine Development- Drilling & Blasting	04			04
4	10MI304	Mine Environmental Engineering	04			04
5	10CE305	Mine Surveying – I	04			04
6	10GE351	Mining Geology-I - LAB			02	01
7	10EE355	<b>Mine Electrical Engineering -LAB</b>			02	01
8	10MI352	Mine Development- Drilling & Blasting- LAB			02	01
9	10MI353	Mine Surveying - I - LAB			02	01
10	10MI354	<b>Mine Environmental Engineering-LAB</b>			<b>02</b>	<b>01</b>
			20		10	25
<b>Total Credit=25</b>						

<b>Teaching and Examination Scheme Diploma-IV</b>						
S. N.	Subject Code	Subject Name	L	T	P	Credit
1	10MI401	Method of Work Coal	03	02		04
2	10MI402	Surface Mining	04			04
3	10MI403	Mining Legislation and General Safety	04			04
4	10MI404	Mine Environment-II	03	01		04
5	10GE405	Geology-II	03	01		04
6	10MI451	Method of Work Coal LAB			02	01
7	10MI452	Mine Environment-II LAB			02	01
8	10GE453	Geology-II LAB			02	01
			17	04	06	
<b>Total Credit=23</b>						
9	10MI454	Practical Training and Assessment	<b>During IV and V semester break for 45 days marks to be awarded in V Semester</b>			
<b>Total Credit=23</b>						

**Department of Mining Engineering,  
Faculty of Engineering & Technology,  
Diploma (Mining Engg.)  
(Session-2015)**

<b>Teaching and Examination Scheme Diploma-V</b>						
S. N.	Subject Code	Subject Name	L	T	P	Credit
1	10MI501	Metal Mining	03	01		04
2	10MI502	Mining Machinery I	03	01		04
3	10MI503	Advanced Mine Surveying	03	01		04
4	10GE504	Rock Mechanics & Strata Control	03	01		04
5	10MI505	Mining Hazard & Safety I	03	01		04
6	10MI551	Semester break Training Report submission				04
7	10GE552	Rock Mechanics (Lab)			02	01
8	10MI553	Mining Machinery (Lab)			02	01
9	10MI554	Mine Surveying (Lab)			02	01
10	10MI555	Metal Mining (Lab)			02	01
			15	05	08	28
<b>Total Credit=28</b>						

<b>Teaching and Examination Scheme Diploma-VI</b>						
S. N.	Subject Code	Subject Name	L	T	P	Credit
1	10MI601	Mine Hazard Safety and legislation	03	01		04
2	<i>Elective (Choose any one)</i>					
	10MI602-A	Mine Management and Mineral Economic	03	01		04
	10MI602-B	Mine Electrical Engineering, Energy Resources and saving in mining				
3	10MI603	Mine Machinery-II	03	01		04
4	10MI604	Mine Sampling Assaying Coal/ Mineral Processing	03	01		04
5	<i>Project Work (any one from A or B)</i>					08
	10MI651-A	Surface/open Cast Mine				
	10MI651-B	Under Ground Coal Mine				
6	10MI652	Mine Machinery-II LAB			02	01
7	10MI653	Mine Sampling Assaying Coal/ Mineral Processing LAB			02	01
8	10MI654	Mine Hazard and Safety-II LAB			02	01
			12	04	06	27
<b>Total Credit=27</b>						

**Diploma (Engg.)**  
**Mining Engineering**  
**Semester-III**

**Mine Electrical Engineering**

**Unit-I:** Introduction -Basic electrical engineering, Faraday's law of electromagnetic induction, D.C. Generator, emf equation, type of generator, A.C. fundamental, basic idea of alternators (type, equation of emf), power factor, power triangles, method improving p. f. Resistance/ Capacitor/Inductance, RLC circuit,

Fundamental of transformer 1- $\emptyset$ ,3- $\emptyset$  emf equation, transformation ratio ( $K = \frac{e_2}{e_1} = \frac{n_2}{n_1} = \frac{i_1}{i_2}$ ) numerical on it. KVA rating and calculation. Open/short circuit test of transformer. Maximum efficiency, all day efficiency losses in transformer, concept of  $\frac{\Delta}{\Delta}$ ,  $\frac{\Delta}{\Delta}$ . Connection of transformer.

**Unit-II:** Single phase induction motor/working principles 3-  $\emptyset$ . Induction motor (sq. cage/slip-ring). Double revolving theory, method of starting.  $\frac{\Delta}{\Delta}$  starter, auto transformer starter, Rotor resistance starter, slip, torque, losses, efficiency.  
Synchronous Motors: Methods of starting, operation of synchronizing motor as a condenser and as a reactor, Application in Industries and Mines

**Unit-III:** Transmission and Distribution of Electrical Power in Mines concept of EHT, HT, LT voltages: Performance of short transmission lines; radial and ring-main distribution systems, line diagram from generation to load centre. Substation arrangements for opencast and underground mines, distribution of electrical power in mines, cables used in mines.

**Unit IV :** Mining type switchgears and protective devices: Types of circuit breakers, Gate end box, Drill panel, and Tran switch, Field Switch. Symmetrical faults and circuit breaker rating calculation. Protective relays: Thermal and induction disc type overload relays; mining type earth fault relay. Signaling and communication: Haulage and Coal face signaling systems for underground coal mines, basic concept of underground mine communication

**Unit-V:**Electrical Safety in Mines: Neutral Grounding and Equipment earthing practice in mines, principles of flameproof enclosure, intrinsic safety, Indian Electricity Rules as applied to mines – mainprovisions. Mine lighting system. Concept of neutral and earth.

***Practical:***

1. To study constructional detail of DC Machine.
2. To obtain Magnetization Characteristics of DC Generator.
3. To study Constructional Detail of Transformer.
4. To obtain load Characteristics and Voltage Regulation of Transformer.
5. No load test of a transformer.
6. Short circuit test of a transformer.
7. No load/load test of a 3- $\emptyset$ . Induction motor, slip calculation.
8. Study and operation of a single phase motor.
9. Measurement of insulation resistance.
10. Measurement of earth resistance by earth tester.

**Text Books**

1. Nagrath and Kothari. Electrical Machines
2. Ashfaq Hussain. Fundamentals of Electrical Engineering
3. Practical Guide to Energy Conservation : PCRA Publications (Unit V)
4. Electrical Engineering in Mines, by N.K.Datta

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

**Unit-I : Geology - 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 of water, 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-II : Physical Geology**

**Erosion & weathering** - Weathering: Physical Weathering and chemical Weathering. Exfoliation and Spheroidal weathering.

**River-** Erosion, transport and deposition; Waterfalls, meanders, oxbow lakes, alluvial fans, flood plains, delta.

**Wind:** Erosion, Transport and Deposition ; Vent facts, Pedestal rocks, sand dunes, and loess.

**Earthquake** - Seismographs, Earthquake waves, Classification of earthquakes, Elastic rebound theory, Richter scale of earthquake intensity, Distribution of Earthquakes in India.

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

**Unit-III: Mineralogy**

Minerals – definition, formation and occurrences. Identification – physical, chemical and optical. Classification of minerals. Identification of common rock forming 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. Classification of Igneous Rocks; acid and basic rocks, Plutonic, Hypabyssal and Volcanic rocks. Tabular Classification of Igneous rock. Texture of Igneous rocks.

Sedimentary Rocks - Definition, Classification; Mechanically formed, Organically formed and chemically formed rocks, Sedimentary Structures; Common sedimentary rocks-Conglomerate sandstone, Shale, minestone and breccias.

Metamorphic Rocks - Definition; Agents of Metamorphism,. Structures and textures of metamorphic rocks. Common metamorphic rocks; slate Schist, Gneiss, Quartzite, and marble .

**Unit-V: Structural Geology**

Strike & 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, 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.

## **PRACTICALS (LAB)**

1. Megascopic Study and Physical Identification of Rock forming Minerals by their physical properties.
2. Megascopic Study and Physical Identification of Igneous Rock by their physical properties.
3. Megascopic Study and Physical Identification of Sedimentaery Rock by their physical properties.
4. Megascopic Study and Physical Identification of Metamorphic Rock by their physical properties.
5. Microscopic Study and Identification of Rock forming Minerals by their Optical properties
6. Microscopic Study and Identification of Igneous Rock by their Optical properties
7. Microscopic Study and Identification of Sedimentary Rock by their Optical properties.
8. Microscopic Study and Identification of Metamorphic Rock by their Optical properties.
9. Draw the outcrop, Dip Strike and profile Section on different kinds of geological structural maps.
10. Study and Sketch of Geological Models showing different types of Faults, Folds and their relations to photography.

### **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 Petrology : 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 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**

Definitions 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 Direct & Indirect 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: Blasting**

Surface Mine - 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

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

**Unit – V : 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

**Practical**

1. Sketch and describe mine inclines top lay out with direct haulage.
2. Sketch and describe about pit top layout.
3. Sketch and describe the different patterns of drilling holes in underground coal mines.
4. Sketch and describe the usual method of drivage of gallery in coal mine showing usual arrangements of pumps, transport (direct rope haulage) and ventilation in dip faces.
5. Sketch and describe different type of exploder.
6. Sketch and describe about the substitute of explosive such hydrox.

7. Describe with Sketch different type accessories of blasting such as safety fuse, detonating fuse, circuit tester, nonel, ohm meter.
8. Sketch and describe about surface machine along with its safety features.
9. Sketch and describe different type of electric detonator.
10. Sketch and describe about drilling machine use in open cast mine.

#### **Text Books**

1. D. J. Deshmukh, Elements of Mining Technology, Vol. I, Denett & Co., Nagpur
2. B.V. Gokhale, Blasthole drilling Technology, Multi Fields, 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**  
**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

**Unit V :** 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

***Practical's***

1. Determination of relative humidity by whirling hygrometer
2. Determination of cooling power of the mine air by using kata thermometer.
3. Measurement of air velocity, quantity and pressure in a duct by using a pitot tube.
4. Design and Describe air crossing, regulator, Ventilating door, air lock at pit top etc
5. Different gases found in coalmines, metal mines and their permitted limits as per the mining regulations. Effect of these gases when found in excess
6. Designing auxiliary ventilation system and their comparative performance
7. Calculation for the installation of main ventilation fan and its reversal arrangement.
8. Various air circuits with resistance in series and parallel.
9. Ventilation survey problem
10. Air conditioning problem

## **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, establishing 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 – Miners dial 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 Miners dial, 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

## MINE SURVEYING-I PRACTICAL - 1

### LABORATORY EXPERIENCES

1. Theodolite traverses survey.
2. Method of co-ordinates.
3. Close traversing by Theodolite & balancing by Bowditch rule & transit rule.
4. Study of Miners Dial its constructional features & adjustments
5. Study of measurement of Depth of a vertical shaft.
6. 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 Mining Engineering**  
**Semester IV**  
**METHOD OF WORK (COAL)**

**Unit I:**

**Bord and pillar method Development:** Bord & 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, strike, crosscuts, steeply dipping seams, loaders, belt conveyer load haul dumpers, belt conveyers chain conveyors. Arrangements for ventilation of Road header.

**Unit II:**

**Board and Pillar method– Depillaring:** Important terms , classification ,planning preparation arrangements , sequence of operations , Pillar extraction under weak roof condition , mechanized 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, Terminology,Applicabilities, merits, demerits, limitations, classification of long wall advancing indicating its applicabilities, comparison between Long wall advancing and Long wall retreatting, development of gate roads, machinery employed on a mechanized Long wall facecontinuous mining method, different factors governing the length of Long wall face, lay outs of mechanized long wall face advancing with caving, layout of mechanized long wall face advancing with stowing.

**Unit IV:**

**Long Wall Retreatting Method:** Long wall retreatting and its applicabilities, layout of mechanized long wall face retreatting with Stowing, layout of mechanized long wall face retreatting 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 mechanized long wall , Horizon mining , merits , demerits ,Applicabilities limitation of demerits. 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

## **Practical:**

### **1) 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) 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) Know the organisations charts.**

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

### **4) 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

## **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&
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

**Diploma 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). Method of 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, 8<sup>th</sup> 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 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 hygienic 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.

**Unit IV:**

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 V:**

**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 organization 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 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/C2 deficiency ratios, reopening of sealed off areas Fire fighting equipment and organization.

#### **Unit II : ventilation plan & Continuous Monitoring of Ventilation System**

Determination of the ventilation efficiency quotient (VEQ), ventilation survey, ventilation plan, crossing point temperature, Continuous recording and monitoring of Air velocity and Quantity- Tele monitoring systems – Advantages – disadvantages of it. Important regulation related to mine ventilation.

#### **Unit III :**

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 as well as ungrounded mines exactly as per statutory norms.

#### **Unit IV:**

**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 V: 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 rations active minerals-causes and preventive measures of nystagmus and Anky-lostomiosias.

## **PRACTICALS**

1. Identifies the parts of flame safety lamp - Tests for the presence of inflammable gas accumulation - different types of flame safety lamps
2. 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
3. Draws the performance/characteristic curves of mine fans from the observations made by conducting appropriate experiments-
- 4. Measurement of air velocity with the help of anemometer,velometer**
5. Determination of the ventilation efficiency quotient (VEQ)
6. To prepare a mine ventilation plan & Determine the cooling power of mine air
7. Study and sketch fire fighting equipments for class A, B,C, D, E Fires.
8. Collection of mine air sample from different parts of the mine by using water displacement methods, pipette and aspirator and vacuum bottles
9. 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.

### **10. Measurement of relative humidity with the help of various types of hygrometer**

## **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

**Diploma 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. Archeans, Dharwar, Cuddapah, Vindyan, Gondwana systems, Fossil: Definition, mode of occurrence, uses of fossils.

**Unit II:**

**Economic Geology:** Definition of forms of Ore, Gangue, Tenor, associated mineral resources, proved, probable, possible reserves, different process of Mineralization, important Economic minerals; Metallic and Non Metallic 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.

**PRACTICALS**

1. Megascopic Study and Physical Identification of Non-Metallic Minerals by their physical properties.
2. Megascopic Study and Physical Identification of Metallic Minerals by their physical properties.
3. Microscopic Study and Identification of Non-Metallic Minerals by their Optical properties
4. Microscopic Study and Identification of Metallic Minerals by their Optical properties
5. Megascopic Study and Physical Identification of different kinds of Coals by their physical properties.
6. Microscopic Study and Identification of different kinds of Coals by their Optical properties
7. Estimation of Ore Reserve .
8. Estimation of Coal Reserve .
9. Estimation of Oil Reserve .
10. Locate and Distribute the various Economic Minerals in India On Indian Map.

## **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

## 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***

### **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 English for Communication, Macmillan.
9. Mohan Krishna & Meera Banerji. Developing Communication Skills. Macmillan.
10. Robbins, S. P. and Hunsaker, Phillip, L” Training in Interpersonal skills”

**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 mechanized methods of raising, jora rise method.

**Unit - II**

**Stoping Methods**–Classification of stoping systems, Selecting stoping method Breast stoping, under hand stopping, 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, explicabilities 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:**

**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 III:**

**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 explicabilities 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 IV:**

**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, explicabilities of different system – clarifies aerial roper ways, the applicable conditions of aerial ropeways.

**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

**Practical:**

1. To study of different types of wire rope its composition & uses in mining.
2. Process of changing of winding rope and its requirement as per regulation.
3. To study of Direct rope haulage system with figure.
4. Study of Endless rope haulage system & its designing aspect with figure.
5. Study of various types of safety devices in haulage system.
6. To study the different types of winding system and their comparative application.
7. Study of different types of locomotive & its application.
8. Study of different types of conveyors with their design parameters & uses in mines.
9. To study the different method of speed control in winding system.
10. Study of different types of Aerial ropeway & its uses.

**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

**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, chord and angle.

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

**Unit IV:**

**Tachometry:** Principles – systems – Constants Methods – Stadia method, subtense 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 underground:** 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 protodyollos 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:**

**Methane layering:** Definition of methane drainage, Different methods of methane drainage, from working seam. Drainage of methane from virgin coal seam. Definition of outburst of coal and gas. Causes of outburst of coal and gas. Prevention of outburst of coal and gas.

**Unit-II: Mine-explosions:**

**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. **Fire Damp Explosions:** Limits of inflammability & statutory aspects. Influencing the same, Causes of fire damp explosions, Preventive measures. Water gas explosion.

**Unit-III: Rescue and Recovery:**

Rescue and recovery operations in mine, Objectives and classification of rescue apparatus, self contained (Compressed oxygen) breathing apparatus. Smoke helmet & its construction details. Gas mask, self rescuer, purpose of resuscitations apparatus, Tests before and after using rescue apparatus, Rescue stations-equipment required, Rescue organization construction and function

**Unit-IV: 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, Accident due to Inundation in chasanala(Dhanbad) accident.

**Unit-V: Regulations:**

Regulation related to Mine inundation CMR-126,127. Regulation related to mine gas, fire and self heating etc.

**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  
**Mining hazard safety and legislation**

**Unit I**

Preventive measures against dangers, mine boundary and barriers, panel barriers, water dams, calculation of dam size and construction. Approaching water logged workings and its precautions, long bore holes by burn side Boring apparatus and its safety and statutory aspects. Standing order in the event of stoppage of MMV and occurrence of fire in u/g mine

**Unit II**

Mine rescue and recovery work- selection of rescue team, initial and refresher training, emergency Organization, rescue procedure in different situation, recovery search for survivors their rescue work Clearing dead bodies and re-establishing system connected with immediate rescue operation

**Unit III**

Actual operation for survival technique, use of bore hole in rescue operation, rescue plan water danger plan, conventional sign of schedule fifth of rescue rule, adjusting and test of breathing apparatus, flow meter, bobbin meter oxygen etc.

**Unit IV**

Composition of safety committee, function of safety committee work men inspector, duty of work- men inspector, provision of canteen, accident to mine rescue brigade member, Rescue chamber, refuge station or refuge bay, barricades.

**Unit V**

A. Important regulation of CMR 1957 such as CMR  
31A,32,32A,33,35,83,87,99,100,104,105,107,108,113, 136A,142, 143

B. Indian electricity rule



**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.
  
9. Water barrier.
  
10. Emergency organization in underground mines.

**Text & Reference Books:**

P.Seshagiri Rao, Law of Mines & Minerals. Pub: Asia Law House, Hyderabad  
Rakesh & Prasad, Legislation in Indian Mines Vol. I & II. Pub: Mrs. Asha Lata Varanasi  
Classified Mine Circulars Issued by DGMS (Compiled)  
Relevant Act, Rules and Regulations, Published by Govt. of India  
Elements of Mining Technology Vol-2, D. J. Deshmukh  
Mine Disasters and Mine Rescue – M.A. Ramlu, Oxford & IBH, New Delhi.  
Hand book on First Aid, Published by Multi Disciplinary Centre on Safety, Health &  
Environment, Bhubaneswar  
Mine Safety & Legislation, by S.K.Das, Lovely Prakashan, Dhanbad.

**Diploma (Engg.)  
Mining Engineering  
Semester-VI**

**MINE MANAGEMENT AND MINERAL ECONOMIC**

**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.

**Unit III**

**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 IV :**

**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 V :**

**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 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 of Energy in Mining , Use of electrical energy 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 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.

**Unit II :**

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 Linksd)

Extension Canopy

e) Face Guard

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

**Unit III :**

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. 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. Signalling-Method of signalling in mines – electrical signalling, circuit indicators – Mining telephones operation.

**Unit IV :**

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. 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 V :**

**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.

## **PRACTICAL**

1. To study the different type of power support with its merit and demerits.
2. TO STUDY THE DIFFERENT TYPE OF SHEARER AND ITS CONSTRUCTIONAL DETAIL.
3. TO STUDY ABOUT THE SILENT FEATURE OF COAL DRILLING MACHINE.
4. TO STUDY ABOUT THE CONSTRUCTION OF DIFFERENT TYPE OF CABLE.
5. TO STUDY ABOUT THE CENTRIFUGAL PUMP AND ITS PRINCIPLE OF WORKING.
6. TURBINE PUMP AND ITS PRINCIPLE OF WORKING
7. TO STUDY ABOUT THE SUBMERSIBLE PUMP AND ITS FITTING.
8. TO STUDY ABOUT THE DIFFERENT TYPE OF SIGNALLING SYSTEM USED IN MINES.
9. TO STUDY ABOUT THE FLAMEPROOF APPARATUS AND ITS CONTRUCTION.
10. TO STUDY ABOUT THE LAYOUT OF SURFACE SUBSTATION.

### **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 Mining Engineering**  
**Semester-VI**  
**Mine Sampling Assaying coal/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 - assay map, assay plan factor, assay values, grade value, tenor, 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 – Specification of coal to be used in steel plants (for coking coal) and other plants (power plants, cement plants etc).

**Unit V :**

Coal quality improvement while mining, Coal handling, Dry coal beneficiation, Wet coal beneficiation, National Mineral Policy.

**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 Mining Engineering**  
**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.
- Stopping methods for non-coal mining
- Mechanised stopping 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