Curriculum
For
Certificate in Underground Mining
(Certificate Level - 6 months)
Code:VE42S003
(2013)

Contents

Introduction:

After petroleum the second fuel is Coal. Coal is also the prime source for global energy requirements. Coal is mostly mined by the Underground mining. Underground mining is extra courageous act of the human beings. During hunting the treasures humans found black gold i.e. Coal and started " Underground Mining" hundreds of feet beneath the earth surface. The major tasks to win underground mineral treasure were & are A. to reach safely , to survive safely and to work safely. B. to retain roof and sides of working area and exit area intact C. to mine maximum possible quantity. C. to transport mined mineral, completely and safely to surface.

These underground mining tasks are refined and developed day to day in world. Most of processes in developed countries are mechanized now. In our country unfortunately underground mining is done manually even in twenty first century. Being less even undeveloped and operated by untrained labor and controlled by untrained supervisors it is even more exposed to dangers and risks.

Provincial Inspectorate of Mines are responsible for Safety & Rescue trainings but those trainings are too short & not aimed to cumulative approach of professional capability inheriting HSE and Rescue as a built in factor or embedded part.

It is first time that an effort is being done to merge knowledge, capability and safety awareness all in one in a comparatively long term course covering all essentials in one.

This will provide a ready to use human resources to upcoming coal fields of Meting Jhimpir , Sonda Jheruck , Badin , Thar and all fields in Baluchistan and KPK.

Objectives of the Course

To prepare and avail a well trained and capable human resource.

To introduce Mines Act , Mines Regulations and other related laws about work, workplace, workers and working methodology.

To realize the advantages of safety procedures.

To play a lead role to overcome the traditional unsafe practices.

To minimize the accidents even risk factor.

Through introducing trained human resource ,to bring underground mining to certain standards.

To put a curriculum base subjected to be developed / modified as per ever changing or forthcoming field requirements.

Competencies gained after completion of the course.

Know the direction , flow behavior , simple chemistry of Air.

Measure dipping angle of Inclined shafts.

Identify the layering hierarchy of earth at working place.

Know the stability behavior and measures to stabilize the specific layer encountered in immediate roof.

Know the roof pressures , side compressing and floor heaving reasons and remedies.

Know the use of wooden supports , spacing frequency , circumference , type of wood , size of wood.

Know the supporting gates terminology , types of supporting gates and their fixing method, broken roof supporting systems.

Know the loose particle strata , packing method , plank size and inspection method.

Know dipping angle of coal seam and know striking direction of coal seam.

Know different underground mining methods.

Know difference between Natural Ventilation and Artificial Ventilation.

Check underground Air direction.

Monitor Coal quality.

Know reasons of heat and fire underground.

Know heat / hot area isolation methods i.e. stopping and fire extinguishing methods.

Know Water bearing strata , sources of inundation.

Know to pool up water in sumps, uses of water lifting pipes and pumps.

Know safe and efficient Coal cutting.

Know straight lining of underground centers.

Knowledge Proficiency Details

On successful completion of course , the trainees must have acquired the following knowledge:

Underground Mining Methods.

Underground Mining Essential shaft components.

Underground Mine Development Process.

Underground Mine Inspection need & Process.

Underground working labor humanitarian & professional needs.

Underground Mining operation.

Underground mineral transportation process.

Under ground to underground and from underground to surface communication.

Read & understand Magnetic or true north on map

Read and understand Planning Map , Mine Plan , Master plan and make rough sketches.

Monitor Heat , Air velocity and direction and dust at working places.

Control the direction of mining to adopt the planned mine plan.

Use of tools & related machinery.

Aware about Safety.

Able to isolate exhausted area / fire area or fallen area.

Current & Future Job Opportunities

Following are ultimate openings

Existing Coal fields at all provinces of Pakistan.

Waiting or forthcoming coal fields for example Mega projects of Thar Coal Underground Mining.

There is statutory requirement for each underground mine at least one " Mine Sirdar / Manager "

(According to requirement of Inspectorate of Mines, Government of Sindh, 05 years experience of underground coal mining is necessary for obtaining Mine Sirdar Certificate).

Trainee Entry Level Requirement

Matriculation.

Minimum Qualification of Teacher /Trainer

DAE in Mining with 5 years underground mining experience.

B.E Mining with 3 years underground mining experience.

Medium of Instruction

Sindhi / Urdu / Pashto

Sequence of Modules

Trainee must go through first module to understand the basics

Curriculum for Underground Mining

Module Title and Aim	**Learning Units**	Theory Days /Hours	Work Place Days/Hours	Time frame of Modules
Module 1 Introduction to Underground Mining	LU1. Physical Components of Underground Mine LU2. Basic Terminology and need of specifications LU3. Overview of Laws, Acts & applicable Regulations LU4. Org; Chart of UG Mining Duties & Responsibilities LU5. Intro of Schedules A to H entry process & demo LU6. Stages of UG mine from Development to Closure LU7. Routine daily operations details and reactive acts LU8. Basic Geology , sedimentation expected behave LU9. Coal seam angles of dip and striking directions LU10. Underground Mining Methods	34	105	
Module 2 Conduct Inspection of Mine	LU1. Team for Inspection specified duties & entry in Shedule B LU2. Inspection tools, instrument, limits. LU3. Water, Gas, Fires inspections & Preventive acts LU4. Previous & current support & Packing inspection LU5. Stairs, centers, roof, sides, floor and working face galleries ,Goaf area, pillars and safe exit inspection LU6. Operational Procedures inspection LU7. PPE's Inspection LU8. UG and from UG to surface Transport inspection LU9. Post operation wastage removal inspection	22	112	

	LU0. Equipments ,Wires, switches, cables and machinery expected hazard inspection. LU11. Surface operations & equipments Inspection			
Module 3 Coal Cutting	LU1. Height ,width and caring immediate roof or extra roof (Chhapar katai) Coal cutting . LU2. Coal quality considerations impurities in Coal bed LU3. Planned direction as per mine plan. LU4. Difference in Advance & Retreat Coal Cutting LU5. Horizontal and inclined seam Coal cutting	10	68	
Module 4 Mucking & Hauling of Coal	LU1. Coal sizing ,Sorting filling in Gunny bags and sewing bag mouth LU2. Docking point, UG hauling , Bundle hoisting. LU3. On surface handling of Coal bundle and stacking LU4. Haulage Driver authentication and practice	6	40	
Module 5 Provide Timber Support in UG Mine	LU1. Timber types, circumference, sizes wood alarm. LU2. Support gates types ,frequency and replacement LU3. Packing , Plank dimensions, Chawks LU4. Wood treatment , spare stocks fire prevention LU5. Supports in Goaf Area.	10	79	
Module 6 Manage Inventory	LU1. Store yard of Wood , Mud , Bricks , Gunny bags, Iron ropes , Mechanical parts , ready lamps extra helmets , fans ,ventilation ducts, fan motors , tripods. LU2. Schedule A, B, C ,D , F, G and Schedule H for each mine. LU3. Periodical Returns forms I to IX ready printed. LU4. Dewatering of mines and uses of pumps & pipes.	12	24	

Module 7 Communication	LU1. Direction of mining as per UG Mine planning , Production Control orders from management. LU2. Inspection observations recording and if danger or immediate need arises communication with management. LU3. Daily directions from supervisors LU4. Delivering directions sharing information to subordinates, concerned workers and colleagues. LU5. UG communication to Surface. LU6. Communication with Mining Engineer and surveyor LU7. Communication with safety & Welfare officer LU8. Monthly communicate for works & repairs	16	12	
Module 8 Mine Survey	LU1. Introduction of lease plan with x y co ordinates and physical pillars stretching boundary line. LU2. Planning and actual Master plan. LU3. Contour maps LU4. Geological features map LU5. Drill hole data map /plan LU6. Mine plans , seam wise	17	111	
Module 9 Safety & Health	LU1. Personal Protective Equipments LU2. Predicting potential safety threat LU3. General workplace safety LU4. Fire fighting LU5. Prevention of UG reserves i.e. Mineral wealth from burning in fire.	22	69	

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
	LU6. First aid arrangements LU7. Periodical checkups or data to information LU8. Safety refresher courses					
Module 10 Rescue Operation	LU1. Rescue apparatus LU2. Rescue Team LU3. Rescue strategy LU4. Standby arrangements		11	20		

Underground Mining Curriculum Contents (Teaching & Learning Guide)

Module 1: **Introduction to Underground Mining**

Objective of the Module 1: This module introduces essential components of underground mine & defines terminology , introduces to applicable laws of country urges to know geology , coal seam and suitable mining method.

Duration: 139 hours (Theory 34 hours and Practice 105 hours)

LU1	Physical Components of UG Mine	Able to know essential parts and their uses	Introduction Define Geometry of Shafts	10 Hours	Lecture notes Photo slides	Class room plus Visit
LU2	Basic Terminology and need of specifications	Be conversant to understand and use in future communication	Words , terms meanings and other related words for concept clearance	2 Hours	Lecture notes Pages delivered	Class room
LU3	Over view of Laws, Acts & Applicable Regulations	Be familiar with legal liabilities to remain bound with	Laws and their interpretation clarifications and implementation criteria	3 Hours	Acts, Regulations from Code of Mines / Mining Labor Code	Class room
LU4	Organization chart of UG Mining Duties & Responsibilities	Clear the concept of hierarchy	Designations , Powers and responsibility	3 Hours	Chart, Definition duty & responsibility sheets	Class room

LU5	Intro of Schedule A to H , entry process and Demonstration	Be able to record inspection observation , record entering and exiting labor	Day, Period, location definition, specific words reflecting the conditions and remarks	11 Hours	Schedules are copied to make in shape of Registers. Proforma, available in Mining Labor Code	Classroom plus demonstration
LU6	Stages of UG mine from Development to Permanent Closure	How to start with predefined horizontal and vertical angles and specific directions	Air direction N 55 E degree in summer, Vertical angle, 11 deg to 40 degree for human escalation	24 Hours	Lecture Notes Plans , Cross sectional views sketches	Classroom and Work place
LU7	Routine daily operations details and reactive acts	Inspection if abnormality detected no labor allowed to enter	Presence of Gas , in sufficient ventilation or continuing fall	16 Hours	Multi Gas detector, Gas types description with allowable ppm , lantern , anemometer , stick	Classroom and Workplace

LU8	Basic Geology , Sedimentation expected behave	Identify strata and be able to decide to mine or not and direct for specific supporting or packing method	Look, grain size , fragmentation, flow, slippery and breaking behavior	24 Hours	Lecture Notes , Samples	Classroom and workplace
LU9	Coal seam angles dip and strike direction	If seam is inclined , mining method two inclined shafts. If flat then one vertical shaft one inclined up to 40 degree. Strike direction is failure / breaking plan used to decide mining direction.	Drill hole , Geological data	24 Hours	Lecture notes , drill hole records , co related cross sectional view of explored area	Classroom plus u/g visit
LU 10	Underground Mining Method	Able to Decide specific mining method	Compulsions of dipping angle of seam roof conditions coal type.	22 Hours	Lecture notes and related images	Classroom U/g visit physical demonstration

Module 2: **Conduct Inspection of Mine**

Objective of the Module 2: This module defines essential inspection process of underground mine. Recording observations in concerned registers.

Duration: 134 hours (Theory 22 hours and Practice 112 hours)

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Team for Inspection with specific job related personnel and recording observations at schedule B	Able to understand separate duties & responsibilities of each professional	Mine sirdar for leading the inspection. Checking steps , sides, roof and supports by timber man, ventilation and , light by Electrician , heat , smoke by lepoyee qoolee	12 Hours	Lecture notes, Audio visuals	Classroom plus workplace
LU2	Inspection	Able to use			Inspection	Classroom

	tools, instrument, Limits	Instruments i.e. Gas detectors etc and readings on instrument plus capable to define as acceptable or non acceptable limit		1 hour	stick , Gas Detector , anemometer, Lantern, Chalks, Rough pad pen	
LU3	Water , Gas , Fires , Inspections and Preventive Acts	Water bearing strata knowledge. Water refilling rate knowledge. With smell and irregular respiration detect the gas presence. From Smoke and smell feel the presence of fire.	Loose sand bowl demonstration to transport water , moisture bearing wood burning odor and fire smoke in room realizes the presence of fire	3 Hours	Water sealing freezing material , cementing materials , curtains to create pressure difference for exhausting contaminated air , exhaust fans , air ducts method notes and audio	Classroom

					visuals	
LU4	Previous & current Support & Packing Inspection	Support status , pre fall maintenance , packing or not to pack decision ability	Tell symptoms to Identify the breaking support. Shape curve , cleavage and displacement. Roof falling material containing loose particles	2 Hours	New prop , breaking , curved or under pressure prop , broken supports	Classroom
LU5	Stairs , Centers, roof , sides, floor , and workface , galleries, Goaf area pillars and safe exit inspection	Identification between normal and abnormal conditions and availability of facility and difference between correct & incorrect	Stairs must be uniform , in shape not turned to be flat nor missing or turned into ditch. Centers must be straight , one sided or both side caving makes roof weak. Curved	22 Hours	Lecture Notes. Images.	Classroom plus workplace

			centre losses the air volume. Roof intact or packed properly not nearer to touch the loaded thela as to star breaking process. Sides if loose must be packed no fallen material in centers and caved sides. Floor heaving causes failure of support system. Quick flattening of floor by cutting. Working face width and			

			direction proper extra wide or irregular width makes irregular pillars subjected to fall easy. Galleries as passage constantly checked for pressure on sides or roof. Goaf area concentrated supports. Check fragmentation of pillars. Thela line safe exits are available or not.			
LU6	Operational	Able to explain	Labor only		Lecture Notes	Classroom

	Procedure Inspection	what to do first. Able to explain what to get already prepared. Able to clarify what not to do simultaneously	after successful Inspection. No fire fighting Without water arrangement at surface. During roof repair / packing no coal cutting beyond the damaged roof area	3 Hours		
LU7	Personal Protective Equipments Inspection	Able to explain habits of labor discarding helmet , thinking as burden or liability to PPE and risking limbs and life	Human Behavior , Unstable thinking about PPE and safety equipments, realizing experience and declaring no use of PPE	14 Hours	Lecture notes Audio Visuals	Classroom and practice

LU8	Underground and from underground to Surface Transportation Inspection	Able to explain incident / Accident possibilities ant Underground as well as at Surface.	Underground rail track un parallel track , track sides elevation difference, loose loading of bags , steep angle / reverse fear. Non functional turn table. Incorrect winding. Unsealed bags. Slippery at Surface platform. No / faulty braking system of surface thela. Incorrect / non audible signal. Standing in centre of	18 Hours	Lecture Notes Images	Classroom plus Workplace.

			vertical shaft bottom.			
LU9	Post operation Wastage Removal operation	Able to explain about creating reason of accident unconsciously	After Coal cutting non coal lying on UG travel path , rail track , parts of cut wood after timber cutting , gunny bag , greasy material or sewing thread may not become cause of accident	21 hours	Lecture Notes	Classroom plus workplace
LU10	Equipments , Wires, Switches ,Cables and Machinery Expected hazards	Able to aware about potential threats from Wires, Switches ,Cables and Machinery /parts of	Hot Naked Wires , hanging wires , below breaking support wires , Switches coming in path of flowing	20 Hours	Lecture notes Images	Classroom plus Workplace

		machinery	water , hot switches , uncovered switches , Uncovered machinery , fan blades , fly wheels , unstable brakes , torn rope , fragile pulley , bent tripod pillar			
LU11	Surface Operations & Equipments Inspection	Able to explain the surface machinery , operation & possible incidents	Surface Machine operators age , license , hearing , eyesight . Hoisting machine room's roof , rainy weather effect , Machine foundation ,	18 Hours	Lecture notes	Classroom plus workplace.

			rope condition, pulley direction , width of track on vertical shaft mouth			

Module 3: **Coal cutting**

Objective of the Module 3: This module describes Identity of Coal and Coal cutting process.

Duration: 78 hours (Theory 10 hours and Practice 68 hours)

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Height Width and Caring Immediate roof or extra roof (Chhapar Katai) Coal cutting	Able to explain cutting method , cutting limits , sorting of other than coal material.	Immediate roof types and their behavior, Cutting dimension in large & small seam ,	17 Hours	Lecture Note. Images	Classroom plus workplace
LU2	Coal Quality consideration and impurities in Coal bed	Able to identify Coal and able to decipher relatively coal looking strata and check impurities	Coal colour , weight , luster, streak, resin dots moisture and fragmentation style. Carbonaceous shale	14 Hours	Lecture Notes. Coal Sample. Carbonaceous shale samples. Other impurities present in field samples of all.	Classroom if laboratory facility.

			differences from coal.			
LU3	Planned direction as per mine plan	Able to read pencil work on planning map or on master plan showing direction of today's assigned centers and their direction	Advancing angle , next ventilation crosscut , angle correction in specific centre. Effect on Pillar dimension. For Parallel movement instructions to labour	21 Hours	Lecture Notes. Sketches. Planning Map , Master Plan , Mine plan , related stationary to measure on plans and to draw.	Classroom
LU4	Difference in Advance & Retreat Coal Cutting	Able to explain pillar cutting. Pillar cutting types/ methods. Difference of urgency for support installation. Retreat	Roof pressure in retreat. Support concentration in retreat. Ventilation direction in retreat mining	14 Hours	Lecture note	Classroom plus Workplace

		cutting direction. Able to realize importance of Ventilation curtailing to create pressure difference.				
LU5	Horizontal and Inclined seam Coal cutting	Able to explain coal cutting method in vertical seam, Underground transportation and ventilation method in vertical seam method.	Changed Physical components Crawling position of coal cutter and other variation because of dipping angle. Coal falling by gravity. Both shafts inclined in vertical seam. Ventilation and	12 Hours	Lecture Notes	Classroom plus workplace

			transportation of coal difference.			

Module 4: **Mucking & Hauling of Coal**

Objective of the Module 4: This module narrates mined coal physical inspection collection & transportation.

Duration: 46 hours (Theory 6 hours and Practice 40 hours)

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Coal sizing , sorting filling in gunny bags and sewing bag mouth	Able to explain that size matters. Realization about quality control from root.	Practice concentration for quality. Sizing place at manual mine is this only. Honest practice of not mixing impurities. Perfect Mouth sealing to avoid spillage.	17 Hours	Coal lumps. Gunny bag. Sewing needle thread. Lecture notes audio visuals.	Classroom face observation
LU2	Docking point, Underground hauling,	Able to explain primary	Here is no scrapper conveyor.		Lecture notes. Images. Audio visuals.	Classroom physical visit & demo.

	Bundle hoisting	operation to final operation of mined coal.	Human to carry bag on his back to nearest point from where rail track is nearer. Elevate wooden frame e to hold bags is platform / docking point. Hand pushed cart/ thela / track turning table. Movers. Parallel , flat and clean track.	13 hours		
LU3	On Surface handling of coal bundle and stacking	Able to explain spontaneous combustion , shelf life ,	General Chemistry of Coal subjected to fragmentation	14 Hours	Lecture note. Images.	Classroom Surface operation observation.

		stock management options	and spontaneous combustion , causes of stock fires, prevention and isolation methods.			
LU4	Haulage Driver authentication and practice	Able to explain laws about age , certification by mine manager	Mines Act 1923 , Coal Mines Regulation 1926 , Mine Manager, authorities , license form and period of validity.	2 Hours	Mining Labor code , Lecture notes, signed license	Classroom

Module 5: **Provide Timber Support in Underground Mine**

Objective of the Module 5: This module defines Timber Utility in underground mine.

Duration: 89 hours (Theory 10 hours and Practice 79 hours)

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Timber Types ,Circumference sizes wood alarm	Able to explain need , types , specification , load yield of supports	Acacia tree ,Eucalyptus, woods availability , wood treatment , sizes , acceptance & rejection. Use and importance	17 hours	Sample of wooden props with different sizes. Different types. Variation in top to bottom circumference. Lecture Notes	Class room wood stock yard.
LU2	Support Gates types , frequency and replacement	Able to explain or clear the concept to deal with	Use of Mehrabi gate, Chokhat gate, Pitam	20 Hours	Lecture Notes. Images / sketches of gates.	Classroom plus workplace.

		roof and side pressure with different types of supporting frames called gates.	gate, Kenchi gate, simple gate. Replacing tricks of broken gate. Spacing at hard roof , spacing at loose sand roof.			
LU3	Packing , Plank dimensions, Chawks.	Able to explain roof and sides packing method and roof jacking method	Pressure mechanism. Packing material. Process of packing. Squire timber support to jack the roof locally called chawk.	20 Hours	Lecture notes. Plank sample.	Classroom plus workplace.
LU4	Wood treatment	Able to	Wood type,		Lecture notes.	Classroom plus

	, spare stocks and fire prevention.	teach wood prevention from insect bite , planning supports stock ,preventing that stock from cause of fire	specific threat to wood. Post use insect biting of wood. Hot oil treatment of wood. Rain / stagnant water protection. Smoking staff refraining.	14 Hours	Samples of insect bitten wood.	affected area
LU5	Supports in Goaf Area	Able to explain enhanced need at goaf area. Definition of goaf area.	Unsupported span at goaf area. Concentration of supports and without late roof supporting system. No	18 Hours	Lecture Notes.	Classroom and Goaf area visit

			removal of supports after exaction from area.			

Module 6: **Manage Inventory**

Objective of the Module 6: This module works as life line on Underground Mining operation .

Duration: XY hours (Theory XX hours and Practice YY hours)

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Store yard of Wood , Mud , Bricks, Gunny Bags , Iron Ropes, Mechanical Parts , ready lamps , extra helmets ,fans , Ventilation ducts, fan motors , tripods.	Able to explain store mechanism, demand and supply as well as standby or ready to supply in emergency	Store inventory registers , purchase mechanism, seasonal storages , Standby storage for ready replacements.	15 Hours	Stock register , demand slips , issue & receipt slips, purchase orders and specification defining forms. Lecture Notes	Classroom plus stores.

LU2	Schedule A,B,C,D, E,F,G,and H for each Min e	Able to explain use of separate register and collection of required information.	Mines Act 1926 , Schedules A for labor data , B for in out records and so on.	3 Hours	All formats of registers or set of printed registers. Mines Act 1926. Lecture Notes.	Classroom
LU3	Periodical Returns forms I to IX	Able to explain information communication to concerned departments	Definition and addresses ,names of officials as per record and classification of data to make information	3 Hours	Forms , Mines Act 1923 and Coal Mines Regulation 1926	Classroom

Module 7: **Communication**

Objective of the Module 7: This module is primarily important to monitor report and manage all operations of Underground Mining.

Duration: 28 hours (Theory 16 hours and Practice 12 hours).

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Direction of Mining as per underground mine plan. Production control orders from management	Able to explain importance of rescue operation. Limits of production so the quantity of mine supplies	Mine plan updating , frequency of reporting exaction of work place. Extraction volume assessment deployment of labor as per need	2 Hours	Mine plan with , alternate access solutions. Demand slip (Call or other form)	Classroom
LU2	Inspection observations recording if danger or immediate need arises	Be able to demonstrate the management reporting system.	Identification of abnormalities. Priority of reaction. Risk assessment for Responding	15 Hours	Daily Inspection reports copies carrying abnormality reports.	Classroom and UG visit experience.

	communication with management.		report.			
LU3	Daily Directions from supervisors	Able to narrate the set of instructions and its importance	Directions detail to repair , to clean , to hoist other than coal material , to erect stopping and only then start production to have safe practice.	2 Hours	Production reports column of remarks. Mine sirdars demand / requisition slips	Classroom.
LU4	Delivering directions sharing information to subordinates , concerned workers and colleagues.	Able to realize the importance of sharing alerts / warning or information regarding safety.	In absence of public address system man to man communication with exact spirit.	2 Hours	Chit /slips if available but only verbal or voice communication is in vogue.	Classroom.
LU5	Underground communication to Surface	Able to explain terminology, audible signals, that	Responsibilities of communicator. Steps of communication tools of	1 hour	Lecture notes	Classroom.

		causes process operative.	communication.			
LU6	Communication with mining engineer and surveyor	Able to explain the status of underground mine to decision making authorities or updater at mine plan	Realization of repair , need of some thing out of routine and seeking alternate solutions on mine plan after Updating by surveyor.	2 Hours	Lecture Notes	Classroom
LU7	Communication with Safety & Welfare Officer	Able to define the rights of labor and need of safety trainings	Union Agreements, Safety Codes, Safety training, Education of children.	2 Hours	Laws , Rules , Regulations of Federal & Provincial authorities. Lecture notes.	Classroom
LU8	Monthly Communication for works and repair	Able to define billing system.	Reports regarding Volume & type of work carried out. Production reports. Utility of supports , fuel and	2 Hours	Forms showing specification , countersigning of mine sirdar or other supervisor.	

			other commodities and verification of measurements.			

Module 8: **Mine Survey**

Objective of the Module 8: This module is back bone in Mining practice. Without teaching this module labor and management is blind to monitor and decide.

Duration: 128 hours (Theory 17 hours and Practice 111 hours).

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Introduction of lease plan with x y co ordinates and physical pillars stretching to boundary lines.	Will be able to note lease boundaries and careful for encroachment	Boundary pillars , lease plan , nearest mines of neighboring companies & their possible working areas.	22 Hours	Survey sheet , lease plan	Classroom , lease boundary.
LU2	Planning and actual Master plan	Maximum recovery plan on paper to be implemented underground	Mine method and design implementation planning on paper reduced to small scale	14 Hours	Master plan with pencil work or planning work as well as real updates	Classroom
LU3	Contour map	Mine location	Elevation		Contour maps	Classroom

		decision capability	difference for Ventilation , for access roads for suitable area for construction of labor quarters	2 Hours		
LU4	Geological features Map	Decide for mining operation or not if any fault or fold.	Geological data ,.	20 hours	Geological maps.	Classroom
LU5	Drill hole data map /plans	From drill hole data , sections of earth existence of mineral	Drill hole data , logs , core samples	14 hours	Drill hole date sheets or books	Classroom drill hole location xy co ordinate plus elevation checking and seeing core boxes
LU6	Mine plans seam wise	Mining operation progress	Mining point , remaining area, next dimension to excavate.	27 Hours	Mine plans	Classroom mine plan taken to UG for comparison / verification.

Module 9: **Safety & Health**

Objective of the Module 9: Describing Importance of safety in continuation of work and increased output in healthy environment.

Duration: 91 hours (Theory 22 hours and Practice 69 hours).

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Personal Protective Equipment	Able to explain the need and use of PPE's	Impacts of Head Injury , Dust particles to eyes and inhaling , exposure of hands to injuries , dropping of tools on foot , working in fire area.	17 Hours	Helmet , Goggles, Dust Mask , Gloves ,Safety Shoes , dungaree .	Classroom , Under ground visit interaction with labor.
LU2	Predicting Potential Safety threat	Able to make conscious	Loose clothing , naked eyes ,	18 Hours	Lecture notes , Audio visuals	Class room uG visit to detect safety threats.

		about Human error , machinery accidents,	uncovered machinery or fast moving parts of machinery.			
LU3	General Workplace Safety	Able to declare the specific conditions to standardize the work place	Temperature , Humidity , light , Noise , air velocity, fine dust/ Coal dust particles minimum or maximum human acceptable ranges.	21 hours	Lecture Notes	Classroom workplace.
LU4	Firefighting	Able to define fire and fire fighting principles and team work.	Causes of fires , extinguishing equipments , extinguishing chemicals , extinguishing methods.	3 Hours	Foam cylinders , fire proof clothes , shoes , gloves , s	Classroom
LU5	Prevention of UG reserves i.e Mineral wealth	Able to realize the value of	Demand conditional production,	3 Hours	Lecture notes	Classroom

		mineral and create awareness for responsible practice	Goaf retreat with care , No extra stocking , fire prevention UG as well as at surface in stocks.			
LU6	First Aid arrangements	Able to explain essentials in equipment , medicines , and training	First aid kit , Oxygen cylinder , stretcher , Ambulance	23 Hours	Equipped dispensary , kits , gas cylinder , dressing material.	Classroom Workplace (Dispensary)
LU7	Periodical checkups or data information	Able to explain the mode of recording the accidents , diseases and evaluate the cause and frequency	Data tells majority type , nature of accidents and most encountered disease	3 hours	Accident Register, OPD Register, Indoor patient record.	Classroom
LU8	Safety Refresher	Able to explain the	Importance of reminding ,		Charts , images , lecture notes , audio	Classroom

	Courses	human memory , forget fullness , ignorance	new updates , input from labor.	3 Hours	visuals.	

Module 10: **Rescue Operation**

Objective of the Module 9: Defining preparedness and dealing strategy to crucial situations.

Duration: 31 hours (Theory 11 hours and Practice 20 hours).

LU#	Learning Unit	Learning Outcome	Learning Element	Duration	Materials Required	Learning Place
LU1	Rescue Apparatus	Able to define essential material and their required condition	Pulling from affected place , safe transportation on y and x axis operators essential kit	22 Hours	Zangoo (Bucket) Zambell (Pouch) , fire proof acid proof kit BG 174with respiratory cool oxygen facility	Classroom plus identification and learning use with practice wear the kit.
LU2	Rescue Team	Able to define qualities and experience and integrity of team	Types i.e fire fighter , vigorous excavator , strong fetchers and expert and quick fixers of supports	3 Hours	Images , audio visuals.	Classroom
LU3	Rescue strategy	Able to	Avoiding Risk		Lecture notes ,	Classroom

		explain need of patience , concentration , step by step actions , obliging leader.	for rescue team , no more accidents in name of rescue operation , plan observe and steps making one leader.	3 hours	audio visuals.	
LU4	Standby arrangements	Able to teach / explain preparedness regarding materials and next rescue team	Standby Communication , pulling system , exits , surface arrangements for serving the rescue team demands	3 Hours	Lecture note and audio visuals	Classroom

Underground Mining Curriculum Assessment

Underground Mining – Curriculum Contents (Teaching & Learning Guide)

Module 1: **Introduction to Underground Mining.**

Objective of the Module 1: This module introduces essential components of underground mine & defines terminology , introduces to applicable laws of country urges to know geology , coal seam and suitable mining method.

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M1-LU1: Physical Components of UG Mine	3 Hours	7 Hours	• Defining Angles & unit of angle. • Defining Difference between Horizontal & Vertical Angle. • Difference between Vertical & Horizontal axis. • Defining Diameter. • Direction of Air with	• Geometrical Drawing. • Plan & Cross sectional views on paper. • Physical demonstration. • Written exercise & Oral query.	

			Angle. • Distance between Vertical & Vertical Shaft (under the mine) should be specified as per Mines Rules & Regulation. • Room & Pillar, Longwall/shortwall Method. • Room width , Pillar dimensions, specifications of all all Mining Methods as Mines Rules & Regulations.		
M1-LU2: Basic Terminology and need of specifications	2 Hours	0 Hours	• Dip , Kunwan. • Low level High Levevl. • Tapri, Galla. • Zenay • Purp , Gattoo , Takhta • Buddi , Sarbuddi, Belcha mar , suttar	• Custom made dictionary. • Translation to local language. • Correction of pronunciation. • Meaning & purpose. • Oral query	

			mar , Tappal , Thela , Thela lane. • Hawai , center lane , bagal • Tight , double	• Item pointing and asking its name.	
M1-LU3: Over view of Laws, Acts & Applicable Regulations	3 Hours	0 Hours	• Acts for Appointing Manager. • Punishments Act if violation. • Coal Mine Regulation for Side roof and roadways. • Acts regarding duties & Responsibilities of Owner , Agent ,Manager. • Power of Inspectors & Section 19	• Defining Difference between Act & Regulation. • Purpose of Act & Regulation. • Interpretation & use of Act & regulation. • Forms or Registers related to specific Act & Regulation. • Written & Oral query. • MCQs & Fill in blanks.	
M1-LU4: Organization chart of UG	3 Hours	0 hours	• Defining Organization purpose & setup. • Top to bottom &	• Written Q & A. • MCQ & fill in blanks.	

Mining Duties & Responsibilities (Mine Rules & Regulations)			branches (Management Chart). • Define Owner & powers of financing. • Define Agent duties & power of hiring & firing. • Define Manager Power of appointing , Transfer. • Manager's Duty of Inspection. • Managers duty regarding underground all operations.	• Drawing branched chart • Who is under whom clarification orally.	
M1-LU5: Intro of Schedule A to H , entry process and Demonstration	3 Hours	8 Hours	• Define schedule A & its columns. • Define what specific each column inquires. • No extra , No less entries as per inquiries. • No overwriting. • No defacing &	• Making practice of filling each register. • Practicing filling each column. • Period , symbols and signature points. • Practicing correct & incorrect	

			alteration. • No incomplete entry. • Presenting , Defining all registers from A to H.	entered data. • Maintaining mine wise set. • Practically filling on supposed data. • Identification of registers. • Drawing columns of a register as assignment.	
M1-LU6: Stages of UG mine from Development to Permanent Closure	4 Hours	20 Hours	• Location of vertical shaft on master plan. • Location of inclined , parallel shaft on master plan. • Direction of inclined shaft. • Elevation difference between Vertical & Inclined shaft. • Angle of Inclined shaft. • Arrangement for development labor. • Date of	• Master plan study and numbering the mine. • Periodical updating. • Length & height of steps. • Practical demonstration on site. • Rate of development monitoring. • Demonstration joining process.	

			commencement of mining operation. • Recording & Notifying dates. • Before joining artificial ventilation. • Installing & detaching of rail track for development of inclined shaft. • Reaching Coal seam & aircross Joining. • Coal mining making panels , rooms , pillars. • Ventilation cross cuts. • After advance retreating. • Depillaring & Bearing pillars. • Lower & upper seams. • Complete excavation & Final joint inspection.	• Parallel mining & ventilation crosscut. • Depillaring area visit. • Closed mine surface visit. • Written Q & A. • Assignment from theory. • Development form practice i.e Previous + Current += Total	

			• Decision to permanent / Temporary closure , recording dates and arrangements of sealing the openings.		
M1-LU7: Routine daily operations details and reactive acts	4 Hours	12 Hours	• Daily Inspection. • Inspection report. • Labor going u/g entry. • Daily supplies to mine. • Production of mineral . • Production of other than mineral material. • Production target. • Production recording. • Repair works & recording.	• Defining each operation , terminology , concerned person(s) / in class. • Showing on site each operation. • Rough sketch practice of mine plan. • Oral Q & A. • MCQs about operations.	
M1-LU8: Basic Geology , Sedimentation expected behave	4 Hous	20 Hours	• Defining Geological ages , periods. • Defining formation & Group. • Defining Exposed &	• Physical demonstration from horizontal as well as vertical shaft.	

			UG formation. • Defining Strata thickness. • Identification & names (Lithological Layers). • Overlying sequence. • Impact on stability. • Section making & measurement records. • Making rough sketch showing cross sectional view (Lithological Logs). • Know-how about indentifying fault, posh/nipout, folds etc	• Memorizing & oral questions. • Drawing capability of making a log with & without scale. • Strata sample identification. • Formation to inherit valuable mineral & its depth. • Thickness ranges. • Written Q & A	
M 1-LU9: Coal seam angles dip and strike direction	4 Hours	20 Hours	• Deposition History. • Measurement of dipping angle of coal seam. • Cross sectional co related views of drill hole logs as well as	• Underground inspection. • Measurement of angle by level , theodolite. • Falling coal sample on	

			sectional logs. • Identification of mineral seam in correlated sectional views. • Demonstration angle with respect to x axis. • Degrees as average dipping angle. • If nearly flat then mining method. • If dipping on more than 18 degree then mining method. • Breaking direction of coal. • Hardness encountered in cutting coal or Softness in cutting coal caused by strike direction. • Identification of strike direction and planning mine in specific direction.	ground and checking failure direction. • Inquiring from coal cutter labor hardness or easy cutting. • Angle measurement practice on ground. • Brick s , glasses failing pattern demonstration. • Oral viva and practice.	

M1-LU10: Underground Mining Method	4 hours	18 hours	• Roof condition Stability. • Seam thickness and floor. • Geology of immediate roof. • Angle of dipping of coal seam. • Room & Pillar Method. • Long wall/shortwall advance method. • Long wall retreat method. • Manual mining. • Semi Mechanized mining. • Mechanized mining. • Pillar dimensions & width of galleries .	• Geological data revising. • Geological data conditioning if then system. • Specifications of room , pillars. • Supporting system. • Machinery usage. • Production & life of mine. • Physical demonstrating. Audio visual demonstration. • Wreitten Q & A.	

Module 2: **Conduct Inspection of Mine**

Objective of the Module 2: This module defines essential inspection process of underground mine. Recording observations in concerned registers.

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M2- LU1: Team for Inspection , specified duties and entry in Schedule "B" and Report of Daily inspection of mine.	2 Hours	10 Hours	• Mine sirdar , Timber man, Plastering (Lepoyee) collie, one from Jodi. • Team leader mine sirdar indicating & notifying abnormalities. • Team noting broken supports , leaked stopping • Cleanliness in incline and rooms at working face. • Entry of Persons in	• Written Q & A • Inspection rehersal. • Oral question about reaction on abnormality detection. • Schedule "B" filling practice.	

			Shedule B • Integrated team members of conducting Inspection up to completion of inspection. • Step by step details observation.		
M2-LU2: Inspection Tools , Instruments and Limits	1 Hour	0 Hour	• Use of Stick for sound narrating condition of roof ,supports. • Multi gas detector. Alarm on exceeding of range of ppm. • Lantern . • Oil safety Lamp. • Canary Bird cage. • Anemometer. • Torch / Chargeable lamp. • Chalk • Rouh pad & Pencil.	• Names of Gasses. • Minimum permissible limit of each gas. • Effect of gas on human being. • Written Q& A • MCQ's • Oral questions.	

			• Sample bag , tape.		
M2-LU3: Water , Gas , Fires Inspections & Prevention Acts.	3 Hours	0 Hours	• Inundation height measurement. • Inundation rate calculation. • Rate of discharge calculation. • Advising sump or pump as per need. • Heat in galleries, hot stopping, noxious gases smoke emission . • Sealing ,of leaked stopping. • Fire extinguishing by foam or water.		
M2-LU4: Previous & Current Support & Packing Inspection.	2 Hours		• Noting Status of already fixed supports bent , breaking , under torsion or broken. • Marking with chalk means identifying for replacement. • Loose strata flow	• Feature of wooden support that can tell that support is breaking / broken? • Symbol directing replacement. • Symbols directing	

			inspection. • Cleaning and further packing instruction. • Any new place requiring packing.	to extra pack. • Written Q & A. • Oral viva.	
M2-LU5: Stairs , Centers , Roof, sides , Floor and Working Face, Galleries, Goaf area , Pillars and Safe exits Inspection	2 Hours	20 Hours	• Stair is edged not turned to be round. • Stair edge is continued , not broken. • Stair length is not reduced /or is it not even vanished? • Stair is missing and a ditch is created. • Center is straight. • Center is in shape not the sides are extended. • Roof is not hanging. • Roof is supported properly or not.	• Demonstration of fair condition images of all component from Stairs , Centers , Roof, sides , Floor and Working Face, Galleries, Goaf area , Pillars and Safe exits. • Format of Inspection as assignment to each trainee. • Filled form subjected to oral examination.	

			• Roof width is not extending and center shape is not changing from its design. • Sides are not fragmented. • Floor is not heaving . • Floor is clean; reason of slippery of man & machinery. • Working face is not extra wide. • Working face is not extra high nor deep. • Galleries are intact and properly supported. • Goaf should be properly packed. • Adequate concentration of jacks / supports		

			exist ? • Pillars are not subjected to crushing or fragmentation. • Around & near goaf area safe corners to move & get shelter in case of emergency.		
M2-LU6: Operational procedure Inspection	3 Hours		• In development phase advance with artificial ventilation (Blower/exhaust fan). • In the incline advance with rail track. • In vertical shaft advance with side bricking /cementation if required. • In incline advance with support	• What to do firs & what then. • MCQ's • Fill in the blanks.	

			gates. • During coal cutting first Wooden supports are ready then mining. • Continue erecting supports along with mining don't leave roof unsupported.		
M2-LU7: Personal Protective Equipments Inspection.	2 Hours	12 Hours	• Use of Helmet. • Use of Dust Mask. • Use of Goggles. • Use of hand gloves. • Use of Industrial safety shoes. • Safety Lamp.	• Demonstration by Audio visual of accidents. • Notifying accidents equipment wise. • Types of injuries. • Losses types. • Written Q & A.	
M2-LU8: Underground & from Underground to surface Transportation Inspection.	2 Hours	16 Hours	• Floor condition for walking & carrying coal bag no slippery etc. • Rail track parallelness. • Rail track elevation	• Written content • Form containing minor things pointed out • Detailed inspection filling above form.	

			difference. • Height distance between Rail track and roof supports. • Side distance on loaded condition either not touching to side supports. • Exits for labor at sides when loaded thela moves underground. • Condition of rope for hoisting. • Condition of joining loop for holding bags. • Proper alignment and fixing up of Pully and Rope. • Pulley fixed with stability ? • Surface thela broken ? • Surface thela track	• Q & A in writing.	

			condition. • Surface moving platform bearings condition. • Brakes in rainy weather.		
M2-LU9: Post operation Wastage removal Inspection	1 Hour	20 Hours	• Wastage of other than Coal material. • Wastage of wood material. • Wastage of food causing rates come in. • Forgotten tool • Wastage of any liquid material. • Due to fragementation side fallen material.	• On ground witnessing and defining slippery of man and machinery. • Item wise detail of expected incidents. • Sharp or pointed tool accidents. • Side debris fallen possible accidents. • Inquire more possibilities. • Assignment for separate cause & related incidents. • At site evidences and accident	

				record register as proof. • Written as well as Oral Q & A.	
M2-LU10: Equipments, Wires, Switches , Cables machinery expected hazard Inspection.	2 Hours	18 Hours	• Uncovered fan accidents. • Unstable fan foundation / frame accidents. • Beneath loose sand / dusty environment fan accidents. • Loose fitted wires / sparking wires. • Exposed wires accidents. • Hot switches / sparking switches incidents. • Hanging cable incidents. • Fast moving parts of any machinery are exposed , incidents related	• List of expected incidents and accidents. • Equipment wise / tool wise / item wise query of incident by True and False Q & A. • Oral viva • On ground asking possibilities.	

			to it. • Drill machine mishandling accidents. • Compressor machine , valves , joints , pipes and air leakage accidents. • Pneumatic pick , drill and hammer related accidents. • Machinery excess heating incidents.		
M2-LU11: Surface Operations and Equipment Inspection	2 Hours	16 Hours	• Shaft Tower vibration in excess. • Pulley not firmly fit. • Iron rope old enough to broken strands / wires. • Vision & Hearing of Haulage Operator. • Brake system. • Pulley giving extra	• Itemized inspection remark form. • Condition narrating form. • Evaluating % chances of accident. • Over all chances of accident . • Accident history from accident	

			friction to rope. • Haulage set on unstable foundation. • Moving platform no brake system. • Moving platform is broken. • Size of moving platform is smaller than track. • Extra eroded bearings of moving platform. • Shaft Collar have turned to be weak. • Rain causing slippery of man & machinery. • Bundle frame incorrect winding so that fall of bundle in shaft or over the thela.	register. • Written Q & A that what threat from what.	

Module 3: **Coal cutting**

Objective of the Module 3: This module describes Identity of Coal and Coal cutting process.

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M3-LU1: Height , Width & Caring for Immediate roof or extra roof (Chhapar Katai) cutting then Coal cutting	2Hours	15 Hours	• Immediate roof if short thickness over lain by loose sand no more cutting of holding strata. • If short seam , immediate roof hard chhapar cutting. • If immediate roof loose sand pack and cut or leave coal layer as packing roof. • Two seams joint ,	• Images and defining on spot as cases. • Preventive measures defining & memorizing. • Assignment of observation to student for such type of mines and remedial measures adopted there. • Exchange of observation and method to make	

			middle strata missed , extra height of seam , no support height available. • Wide parting seam cutting.	single volume. • This volume , Written and MCQ type paper.	
M3-LU2: Coal Quality considerations impurities in Coal bed.	2 Hours	12 Hours	• Coal is heterogeneous mixture of Nitrocellulose & Lignocelluloses of plant material. • Coal has resin marks. • Coal is less in weight comparatively to its impurities in unit weight. • Coal has carbonaceous shale looking like coal difficult to identify but less combustible. • Impurity of Coal has white shale easy to identify. • Coal has Gypsum and pyrites causes fire in	• Coal sample identification. • Non coal sample identification and naming. • Oral examination.	

			mines. • All the impurities must be detected and got separated. • At stock coal and on working face impurities to be detected and removed.		
M3-LU3: Planned direction as per Mine Plan.	2 Hours	19 Hours	• Daily before inspection see direction from planned map /plan available at surveyor. • According to direction derive only to avail reserves of this mine. • Deviation from plan can cause to enter area of other neighboring mine. • Mine life depends upon planned work. • Maximum coal recovery also depends upon planned practice.	• Study of Master plan. • Comparing mine plan with master plan. • Noting angle from planned map. • Center direction of room as per planning. • Practice on plain paper using geometrical instruments. • Underground angle measurement. • Mark center line in roof props. • Practice done by individual practically on paper and at underground.	

				• Practical and viva voce.	
M3-LU4: Difference in Advance & Retreat Coal cutting.	2 Hours	12 Hours	• During working in rooms going far from vertical shaft called advance. • Going in the direction of air means going in advance. • At final extraction point coming back called retreat. • Advance practice creates pillars. • Retreat practice means recovering of pillars called depillaring. • Advance wins 20% coal. • Retreat tries to win remaining 80%.	• Physical inspection and identification of advance. • Physical inspection and identification of Retreat. • Support frequency difference. • Roof un supported difference. • Recovery percentage difference. • Air direction difference. • Assignment of Note observe and record. • Sketch making. • Written Q & A	
M3-LU5: Horizontal & Inclined seam Coal cutting.	2 Hours	10 hours	• At flat or Horizontal coal seam Human standing posture. • Flat seam possible for room & pillar , long wall (Advance & Retreat.) • Horizontal	• Co related cross sectional views of coal seams one flat other inclined. • Working method differences. • Assignment of note ,	

			underground transport. • Mine visit of inclined seam. • Inclined seam even 30 to 45 degree. • Human posture in flat and incline seams. • Coal transportation gravity falling through chutes. • Underground movement with & without rail track.	observe and record. • Teachers notes plus assignment. • Written Q & A and oral.	

Module 4: **Mucking & Hauling of Coal**

Objective of the Module 4: This module narrates mined coal physical inspection collection & transportation.

Learning Units	Theory hours	Workplace hours	Recommended formative assessment	Recommended Methodology	Scheduled Dates
M4-LU1: Coal sizing , Sorting filling in Gunny bags and Sewing bag mouth.	01 Hour	16 Hours	• Initial cutting is big lumps , heavy weight , sharp cones subjected to break gunny bag. • Underground secondary breaking to comparatively medium pieces. • Separating of other than coal material. Filling gunny bags of other than coal material and place at separate location. • Sealing coal filled gunny bags tightly so that they should not open during transport process up to surface.	• On face demonstration. • Observing practice and identifying faults in practice to maintain quality. • Observing practice and note safety breaches. • Observing presence of impurities. • Observing other than coal storage at different place and transporting not with coal bundles. • Teachers give notes are seen	

			• Collecting coal near coal cutter in a safe way that cutting tool should not harm collector. • Collection coal should not include ground dust.	practically and observed carefully. • Oral and written Q & A.	
M4-LU2: Docking point UG hauling , bundle hoisting.	01 Hour	12 Hour	• Coal bags lifted on human back to a station / docking point made of wooden supports. • This docking point is nearest point to rail track line. • When there are eight/nine bags they are put on underground hand pushed thela. • They are safely taken from underground route as they should never touch to supports in sides ,	• Whole practice demonstrated at underground. • Directed to note safety , method of practice , method of signaling . • Careful movement to prevent side & roof supports. • All the points noting in their assignment work. Then subjected to Oral & written questioning.	

			supports in roof. Nor they slip to fall. • These bags are taken to bottom of vertical shaft. • With a piece of rope they are bound firmly , this is called bundle. • This bundle is anchored to hoisting iron rope. • Transportation of coal by bundle/mine cars from shaft and incline. • First communication is made to tighten the rope to surface haulage operator. • When bundle is pulled up in air and leaves to and fro movement a voice signal is given to raise it up.		

			• While Bundle/mine car is hoisted to surface, the labor should be get away from center of shaft.		
M4-LU 3: On surface handling of Coal bundles and Stacking.	2 Hours	12 Hours	• The bundle is carefully unloaded on plat form. • Un-tight from iron rope. • Empty bags and winding rope returned down. • Mine cars / Bags moved from shaft thella to stockyard/loading truck. • On surface their may be two separate stocks each one for separate working teams (Jodis) working underground. • On respective side	• Demonstration of each step taken by surbuddy from unloading bundle to dropping coal on stack. • Demonstration to be noted. • Written Q & A and verbal questions.	

			bags are emptied. • Coal should Stock in shape of heaves sized as 3 ft high , 2 ft wide on top and 3 ft wide at bottom. • Above specification adopted to prevent coal stocks from fires.		
M4-LU4: Haulage Driver Authentication and Practice.	2 Hours		• Mine Manager gives a driving license as Coal Mines Regulation 1926. • Mine Manager checks age. • Health & fitness regarding hearing and seeing. • Checks ability or competency to operate. • Can tell about parts of haulage. • Able to raise man in emergency.	• Shown form of driver. • Columns to be demonstrated. • A competent haulage drivers operation demonstrated. • Written questions about whole practice issuing lice and licencing authority.	

Module 5: **Provide Timber Support in Underground Mine**

Objective of the Module 5: This module defines Timber Utility in underground mine.

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M5-LU1: Timber Types , Circumference, Sizes and Wood alarm.	2 Hours	15 Hours	• Demonstration of Acacia tree , Eucalyptus. • Difference in properties of both trees. • Thickness of timber is related to diameter of given length of timber (as per standard), such as timber of 6ft in length should be 6 inches in dia. • Both ends must be equal in diameter. • Timber should be capable of bearing load.	• Wood type identification from look. • Circumference measurement method. • Height measurement method. • Rejecting / declaring condemn wood standards. • Inspection of both ends. • Dryness/ wetness. • Straightness. • Complete	

			• Timber should not be subjected to be bent on load. • Timber quality should have capability to create cracking sound when pressure on it.	knowledge & observation method practice. • Practically identifying condemn wood. • Samples of wood for oral questions.	
M5-LU2: Support gate types , Frequency & Replacement.	2 Hours	18 Hours	• Defining Mehrbi gates. • Chokhath Gate. • Pitaam Gate. • Scissor/ Kenchi Gate. • Simple gate. • After every 2' a support gate. • In loose sand more concentrated gates. • Gate of 3-5 pieces. If any one piece broken that piece must be quickly replaced with new one. • If not replaceable a jack arrangement.	• Identification & use of each gate. • Load distribution system on gate. • Floor supporting gates. • Written Q & A • MCQ type questions.	

M5-LU3: Packing Plank dimension & Chawks.	2 Hours	18 Hours	• Define where loose sand there packing. • Packing material, hard board, gunny bags and planks of wood. • Planks 1” thick, 3” ~ 4” wide and 3’~ 4’ long. • All made of Acacia(keekar) tree. • All planks in fix size no bent no hole. • Where roof falling starts Square timber support system locally called chocks/cogs. • Chocks/cogs from floor to roof. Artificial pillar of wood.	• Origin of planks. • Specifications of planks. • Practical demonstration. • Written Q & A.	
M5-LU4: Wood treatment , Spare, stocks	2 Hours	12 Hours	• Wood is subjected to insect bites. • Crude oil hot tank treatment for all	• Samples or wood before and after treatment. • Insect bitten	

fire prevention.			wood for insect bite prevention. • Stocks not near to Kitchen , workshop or generators or any cause of fire. • In order to urgent daily demand stock of wood is must for one month at least. • Watchman especially alert for refraining smokers from area.	wood sample. • Wood as fuel to fire so realize the sensitivity. • Questions regarding need of storage. • Need of treatment. • Need of fire prevention.	
M5-LU5: Supports in Goaf area.	2 Hours	16 Hours	• Define unsupported spans. • Jacks or concentrated supporting system. • Do not try to pull supports after excavation. • Quick supporting and quick mining in goaf area.	• Depillaring area is goaf area. • On de pillaring unsupported spar can fall abruptly. • Area demonstration . • Roof inspection. • Continuous and concentrated support system. • Oral questions.	

Module 6: **Manage Inventory**

Objective of the Module 6: This module works as life line on Underground Mining operation .

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M6-LU 1: Store Yard of Woods, Mud, Bricks , Gunny Bags, Iron ropes, Mechanical parts , ready to use lamps extra helmets , fans , ventilation ducts , fan motors , tripods.	3 Hours	12 Hours	• Mining is a continuous process, it can not be paused once started. • This process in continuous demand of wooden support. • In case of fire mud plastering instantly. • Packing by plans gunny bags. • Coal loading material gunny bags , threads needles. • All the routine needed items are stocked at separate stores. • Inventory i.e. available + received = total – issued = available is ultimate to see the enough availability.	• Written Q & A • Slip format • Stock register format. • Demand form filling method. • Oral questions.	

			• Demonstration of store inventory & physical items at store yard. • Demonstration demand & supply system. • Demonstration authenticated requisition slips. • Stock register updating process.		
M6-LU2: Schedule A,B,C,D,E,F, G and schedule H for each mine.	3 Hours		• Use of Schedules A to H. • Model forms of Schedule A to H. • Model filling of Registers.	• Supposed data provided to fill the registers/ schedules.	
M6-LU3: Periodical return forms I to IX ready printed.	3 Hours		• Defining all form from I to IX. • Providing formats. • Providing filled formats to clear the concept. • One set of Data and forms filled as per that data.	• Provide a set of complete data about a supposed company. • Provide blank forms and exercise to fill these forms.	

M6-LU4: De-watering of mine, uses of pumps and pipes.	3 Hours	12 Hours	• Water inundation record. • Recharge of inundation. • Vertical Depth of mines. • No: of inundation points. • Designing of pumps / motors and diameter of suction / delivery pipe. • Pumps and its accessories fitting and electric connection with starter switches.	• Head & through efficiency of pumps. • Formula regarding head and water input. • Q & A about these formula.	

Module 7: **Communication**

Objective of the Module 7: This module is primarily important to monitor report and manage all operations of Underground Mining.

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M7-LU1: Direction of Mining as per UG Mine planning , Production Control orders from management.	2 Hours		• Define planning map and develop rooms, pillars, longwall and faces as per projected planning. • Define mine plan. • Define advantages of centers as per given directions and disadvantages of deviations of centers. • Demand status and requirement of declaration. • Labor strength status. • Instructions of	• Interactivity skill. • Maps + plan reading. • Inquiring demand. • Discussion about possibility. • Written Q & A about this activity.	

			management for reducing or increasing production.		
M7-LU2: Inspection observations recording and if danger or immediate need arises then communication with management.	3 Hours	12 Hours	• Define abnormality in fan. • Broken steps. • If broken supports. • If lantern turns off. • If abnormalities are detected then urgency to report. • Refrain labor from going in till danger exists.	• Entries in inspection register. • Column filling . blank filling exercise. • Management communication to specific person. • Communication in complete not incomplete. • Reporting correct intensity. • Q & A about entire practice.	
M7-LU3: Daily directions from supervisors.	2 Hours		• Define supervisor carry order of the day instruction. • Do only repair of mine & raise kharaba only. • Only repair of	• Scheduling the activity regarding orders of management. • Demand & supply situation expedites production or	

			mining machinery and underground repairs. • Stock cleaning	turns production team to other activities. • Production is controlled by issue of fuel for haulage machine. • Double shift requirement already indicates in early morning to get ready for double production. • Verbal Q & A about production strategy.	
M7-LU4: Delivering directions , sharing information to subordinates , concerned workers and colleagues.	2 Hours		• Mine sirdar is responsible to communicate team of workers for trend of the day. • As per demand he arranges wooden support quota. • Or Mud foe plastering.		

			• Or bricks for permanent stopping. • Means shares the operational priority with fellow workers. • As a team leader he gets it done. This is all done at the start of work.		
M7-LU 5: UG communications to surface	1 Hour		• If underground repairs are to take place only , then from underground it is communicated to surface that today we are not producing enough coal to load any truck. • Now on surface all demands of coal are turned to other mines. • Other requirements	• Priority requisitions are from underground. • Underground demands are sent by voice signals. • Sur buddy on vertical shaft mouth listens and obliges. • Demonstration of this practice will clear the concept. • Some verbal questions about it	

			from underground are served by surface labor to arrange for wooden supports, planks , mud etc.	define job and specific location of job.	
M7-LU6: Communication with Mine Manager / Mining Engineer and Surveyor	2 Hour		• Mine Manager / Mining Engineer is decision maker at field operations. • If anything out of routine then it is necessary to communicate with him. • With clear condition, request to visit, with complete information. • With arguments on plan he can be motivated. • The specific operation can only be done with	• Communication for decision making in exceptional condition is necessary with Mining Engineer. • Practical case of diverting from current center. • Closing advancement & start depillaring. • Ventilation stopping. • Geological problems. • Questions from these case studies either verbal or	

			agreement or approval of Mine Manager / Mining Engineer. • All the bills related to that operation are subjected to approval of Mine Manager / Mining Engineer.	written Q & A.	
M7-LU 7: Communication with Safety & Welfare Officer.	2 hours		• With respect to agreement of labor union when facilities of treatment , EOBI funds, Jahez fund , Hajj draws or qarze hasna mine sirdar is bridge between labor and welfare office. • In case of refresher courses on safety then mine sirdar is again bridge between labor and Safety officer.	• Implementation on agreement of CBA union as well as safety awareness mine sirdar ends communication gap between concerned officers naf management. • One question about this practice.	

M7-LU8: Monthly Communication for works and repairs.	2 Hours		• Extremely important task. • This is concerned with bill /payment verifications. • Company evaluates cost per tone for that month. • Entire record of production , repairs , utilization of fuel , woods and all items.	• Demand slips verified from real work done. • This is monthly statement verification. • Verbal questions about this.	

Module 8: **Mine Survey**

Objective of the Module 8: This module is back bone in Mining practice. Without teaching this module labor and management is blind to monitor and decide.

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M8-LU1: Introduction of Lease plan with X and Y co ordinates and physical pillars stretching boundary line	2 Hours	20 hours	• Defining lease plan and general location of lease.	• Sheet no: reading. • Grid lines no: reading. • Understanding X and Y co ordinates. • Area calculation. • Questions in written.	
M8-LU2: Planning and actual Master plan.	2 Hour	12 Hours	• Define actual master plan as a scaled plan of lease. • Shows location and actual development of each mine. • Planning map also	• Map reading capability. • Line measurement capability. • Convert from scale to real • Questions about them.	

			little bit same with addition to lines showing future aims of development. • Planning is subjected to adopted as per lines drawn.	• Identification o f symbols and questions about them.	
M8-LU3: Contour Maps.	2 Hours		• Elevation on surface contours. • Underground seam contours • Lease boundary contour	• Map readability questions. • Seams tracing on map.	
M8-LU4: Geological features map.	2 Hours	18 Hours	• Map made by authorized agency i.e. G.S.P. • Shows Folds • Faults • Seams • Exposed group / formation • Nala River lakes • Hills & mountain sequences.	• Able to understand faults , folds. • Seams • Target formation.	

			• Exposed crops of minerals. • Geo age • formations		
M8-LU5: Drill hole data map / plan.	2 Hours	12 Hours	• Define that for exploration purpose drill holes done. • Drill hole location. • Drill hole no: • Drill hole elevation. • Co related plan.	• Logs and result of drill hole. • Elevation difference effect on seam. • Geophysical log • Core log. • Questions about these.	
M8-LU6: Mine Plans , Seam wise.	2 Hours	25 Hours	• Define mining activity shown on map is mine plan. • In case of more seams at same place separate mine plan for each seam.	• Signs/ symbols of mine plan. • Inter bed distance. • Related questions	

Module 9: **Safety & Health**

Objective of the Module 9: Describing Importance of safety in continuation of work and increased output in healthy environment.

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M9-LU1: Personal Protective Equipments.	2 Hours	15 Hours	• Define use of Helmet , Goggles , dust mask , Hand gloves and safety shoes.	• If not PPE's than possible accidents. • Question about possible accidents and advantage of using PPE's.	
M9-LU2: Predicting potential Safety threat.	2 Hours	16 Hours	• Define a capability to predict if support is broken what will happen ? • If fire erupts what will be effect on human health. • If smoke or gas erupts then danger to human health.	• Gas , Fire , Smoke , Fall hazards and effects on humans.	

M9-LU3: General Workplace Safety.	3 Hours	18 Hours	• Define all activities first. • Coal cutter should cut with care to note that there is no any other one near to him and radius of tool movement not causing injury to co worker. • Timber man cutting supports as per size should immediately remove cutting tool from walk way and also cutting waste. • Gunny bag sealing thread should not indulge human feet , nor the needle should injure the workers there. • Drinking water should not be spilt on walking ways to create slippery.	• Note one by one possibilities of incidents. • Note what to do for avoiding these incidents. • Questions about them.	

M9-LU4: Fire fighting.	3 Hours		• Define reasons of fire. • Define preventive measures of fire. • When fire is erupted then extinguishing measures. • Foam , Chemical , Water , dust and sealing of fire area.	• Fire protection measures. • Fire detection acts. • Preparedness for fire fighting. • Periodical checking of fire fighting materials, equipments and team. • Form for querying from reason to preparedness.	
M9-LU5: Prevention of Underground reserves , i.e. Mineral wealth from wasting / burning in future.	3 Hours		• Define mining method and recovery % of different methods. • Production more than demand causes over stocking. • Overstocking causes fire in stocks ultimately wasting the stocks.	• Identification of reasons of reserve wastage. • Prevention measures. • Role players identification. • Continuous watch about mining &	

			• In correct centers , causes premature falls underground and area can not be accessed. • Unfair mining practice disturbs the roof and causes roof fall.	stocking practice.	
M9-LU6: First Aid arrangements:	3 Hours	20 Hours	• Define requirements when incident happens. • Oxygen availability. • Life saving drugs availability. • Fully equipped dispensary. • Round the clock available medical practitioner or dispenser. • Dressing material and pain killers. • Ambulance availability.	• List of equipments. • Urgently required medicines. • Questions about preparedness.	
M9-LU7: Periodical	3 Hours		• Define study of record of Incidents.	• Concerned books ,	

checkups or data to information.			• Study of record of accidents. • Analysis of record. • Resolve the majority of accidents. • See reasons of accidents. • Communicate as information to remove the reason of accident if possible.	registers. • Analysis form. • Max ,Average, Minimum evaluations. • Questions about how to reach the reason and remedy.	
M9-LU8: Safety Refresher Courses.	3 Hours		• Define Human memory losses. • Need of refresher courses. • New equipments , materials , machinery and method to introduce.	• Available reading / teaching material at different sources. • Collection and choosing suitable. • Presentations and lectures etc.	

Module 10: **Rescue Operation**

Objective of the Module 9: Defining preparedness and dealing strategy to crucial situations.

Duration: XY hours (Theory XX hours and Practice YY hours).

Learning Units	Theory hours	Workplace hours	Recommended formative Assessment	Recommended Methodology	Scheduled Dates
M10-LU1: Rescue Apparatus.	2 Hours	20 Hours	• Define Urgency of life saving. • Labor Rescue from underground method. • Cage (Zangoo) arrangement. • Artificial ventilation arrangements. • Fire proof kit as BG-175 • Roof supporting material. • Speedy waste removal arrangement.	• Identify urgently required apparatus. • Make them ready. • Inspection checkups frequency. • Q & A for these apparatus.	
M10-LU2: Rescue Team.	3 Hours		• Define a team of experienced , physically strong ,	• All team member know coal cutting , timer cutting and	

			daring to face the danger team. • Team must be available on round the clock basis. • Team must be integrated. • Team leader more bold who can lead into affected area. • Also be aware of such rescue team in neighboring company as standby. • Checking readiness of team.	all other trades of mining. • They are ready to do all jobs to encounter. • Q & A about this prepared team.	
M10-LU3: Rescue Strategy.	3		• Define Level of decision makers. • Mining Engineers & experienced rescue team leader & member discuss as well as resolve the what to do first. • The define plan &	• Hierarchy of operations. • Communication need & tools. • Obliging leader to avoid confusion. • Quick availability of demanded items.	

			choose initial team. • Start work and remain communicated. • Modify work plan as per requirement.	• Duties in shift to avoid fatigue of team members. • Question & Answers regarding this practice.	
M10-LU4: Standby arrangements.	3 Hours		• Notify other strong & capable workers who also can work as rescue workers. • Standby fan , motors , generators, air duct and curtain. • Stand by haulage machine ,rail track , thela to pull from inclined side.	• List & contact records. • Standby storage location and responsible person contact info. • Shift manager to deploy as per timings. • Q & A about all this.	

Supportive Notes:

The student will be assessed from written / Oral response. He must Identify Books , Registers, Schedules and be able to report for each query or be able to fill himself the Schedules, Registers, forms etc.

Student must be able to communicate with his team and play as team member or even leader too.

Critical aspects.

Must be sensitive to threat of life , not be lazy but sharply responsive. Must be aggressive when lives are under threat.

Assessment condition.

Student must be fully taught , demonstrated , given feedback for course.

No discouraging attitude but teaching attitude should be adopted.

An environment where free to write , draw , speak and do to demonstrate his skills.

Student must individually do and satisfy the examiner.

Special note:

Theor hours are few but practical hours are more because mining field is underground. During acces & to team of student demonstration and teaching on spot gets more time in ug environment.

Tools & Equipment List

Sr. No:	Item	Quantity
1	Hand Spade	3
2	Teekam	3
3	Gunny Bags	10
4	Saw	4
5	Hammers	4
6	Measuring Tape	4
7	Needle	4
8	Shoulder pads	4
9	Stationary items for six months Stapler machines , punch machines ,Caculators.	
10	Geometry Boxes	20
11	Drawing boards	10
12	Safety lamp	2
13	Walking Stick	10
15	Fire Extinguisher	4
16	Helmet	100
17	Safety Gloves	50 sets
18	Goggles	100
19	Industrial Shoes	10 pairs
20	Dust Masks	100

21	Multi Gas Detectors	4
22	Theodolite	2
23	Compass	10
24	EDM	4
25	GPS	4
26	Tool Box	10
27	PCs with laser printers	10 Sets
28	Laptops	6
29	Multimedia projectors	2
30	Screens	2
31	White boards	4
32	Charged lamps with charger	100
33	Anemometer	8
34	Common lanterns	50
35	Magnifying Glass	10
35	Electronic Digital Camera	2

Consumable Material

Sr. No:	Description of Item	
1	Office Stationary, Paper A4 , 90g ,	
2	Markers on White board	
3	Drafting Pens o.2 , 0.3 ,0.4	
4	Film for plans	
5	Registers A to H	
6	Form I to IX	
7	Black board Chalks	
8	Sampling Bags	
9	Tape to seal sample bags	
10	Toner of Laser Printer	
11	Muster Rolls	
12	Correction Pen	
13	File for each trainee	
14	Stapler pins , Gem clips , Erasers, Rough Pads ,Pencils, Sharpeners	

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