

Curriculum For “Crushing Plant Technician/Supervisor”

(Level -4)

25th to 29th October 2021



**National Vocational & Technical
Training Commission**

Contents

Introduction.....	3
Purpose of the training programme.....	3
Overall objectives of training programme.....	3
Competencies to be gained after completion of course.....	3
• Establish and Maintain the Occupational Health and Safety System.....	3
• Perform Advance Communication.....	3
• Perform Basic Machining Operations.....	3
• Disassemble and Assemble Diesel Engine.....	3
• Perform Periodic Maintenance of Hauling Machines.....	3
• Troubleshooting of Crushing Plant.....	3
• Perform Basic Electrical Installations.....	3
• Maintain Power Generator.....	3
• Maintain Hydraulic System.....	3
• Perform Basic Green Skills for Crushing Plant.....	3
Possible available job opportunities available immediately and later in the future.....	3
Trainee entry level.....	3
Recommended trainer: trainee ratio.....	4
Medium of instruction i.e. language of instruction.....	4
Duration of the course (Total time, Theory & Practical time).....	5
Summary – Overview of The Curriculum.....	6
Modules.....	13
1. Establish and Maintain the Occupational Health and Safety System.....	13
2. Perform Advance Communication.....	17
3. Perform Basic Machining Operations.....	19
4. Disassemble and Assemble Diesel Engine.....	27
5. Perform Periodic Maintenance of Hauling Machines.....	32
6. Troubleshooting of Crushing Plant.....	38
7. Perform Basic Electrical Installations.....	43
8. Maintain Power Generator.....	49
9. Maintain Hydraulic System.....	54
10. Perform Basic Green Skills for Crushing Plant.....	58
General Assessment For Crushing Plant Technician /Supervisor.....	60
Assessment Strategy For Crushing Plant Technician/Supervisor.....	62
Complete list of tools and equipment.....	64
List of consumable supplies.....	68

Introduction

Definition/ Description of the training programme for Crushing Plant

Technician/Supervisor

There is an increasing demand of the Crushing Plant Technician/Supervisor in construction industry. If an individual is planning to pursue a career in Crush Plant, this program will be helpful in targeting various industries including construction and mining.

Purpose of the training programme

The purpose of this training is to develop a range of skills and techniques, soft skills and attributes essential for successful performance in construction and mining sector in accordance with industry requirements. Diploma holder of this program may find employment in local and international industries.

Overall objectives of training programme

The main objective of this training program is to improve the employability of young diploma holders through qualifying job-related training in the construction and mining sector, and to train them so that they can prove to be an asset to this sector.

Competencies to be gained after completion of course

- Establish and Maintain the Occupational Health and Safety System
- Perform Advance Communication
- Perform Basic Machining Operations
- Disassemble and Assemble Diesel Engine
- Perform Periodic Maintenance of Hauling Machines
- Troubleshooting of Crushing Plant

- Perform Basic Electrical Installations
- Maintain Power Generator
- Maintain Hydraulic System
- Perform Basic Green Skills for Crusher Plant

Possible available job opportunities available immediately and later in the future

Lathe machine operator
Hydraulic technician helper
Engine Technician
Crush Plant Technician

Trainee entry level

Middle or Equivalent (with English, Urdu, Numeracy, reading and writing skills)

Minimum qualification of trainer

Teaching staff should have Matriculation with at least five years' experience in Crushing Industry. Other formal certification in the Crushing Plant installation and operation from the manufacture or general Fitter would be useful in addition to the above with adequate computer skills.

OR

Teacher should have Level-5 / DAE in Mechanical / Mechanical with specialization in construction machinery with at least two years' experience in Crushing Industry. Other formal certification in the Crushing Plant installation and operation from the manufacture or general Fitter would be useful in addition to the above.

Recommended trainer: trainee ratio

The recommended maximum trainer: trainee ratio for this programme is 1 trainer for 25 trainees.

Medium of instruction i.e. language of instruction

Instruction will be Urdu and English.

Duration of the course (Total time, Theory & Practical time)

This curriculum comprises 10 modules. The recommended delivery time is 1200 hours. Delivery of the course could therefore be full time, 5 days a week. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The full structure of the course is as follows:

No	Modules Title	Level	Theory		Practical		Total	
			C	Hr.	C	Hr.	C	Hr.
1.	Establish and Maintain the Occupational Health and Safety System	4	2	20	3	30	5	50
2.	Perform Advance Communication	4	2	20	3	30	5	50
3.	Perform Basic Machining Operations	4	3	30	15	150	18	180
4.	Disassemble and Assemble Diesel Engine	4	3.3	32	13.8	138	17	170
5.	Perform Periodic Maintenance of Hauling Machines	4	3.3	33	11.7	117	15	150
6.	Troubleshooting of Crushing Plant	4	1.8	18	13.2	132	15	150
7.	Perform Basic Electrical Installations	4	3	30	12	120	15	150
8.	Maintain the Power Generator	4	3	30	9	90	12	120
9.	Maintain Hydraulic System	4	1.8	18	13.2	132	15	150
10.	Perform Basic Green Skills for Crushing Plant	4	0.9	9	2.1	21	3	30
Total			24	240	96	960	120	1200

Sequence of the Modules

Each module covers a range of learning components. These are intended to provide detailed guidance to teachers (for example the Learning Elements component) and give them additional support for preparing their lessons (for example the Materials Required component). The detail provided by each module will contribute to a standardized approach to teaching, ensuring that training providers in different parts of the country have clear information on what should be taught. Each module also incorporates the industrial needs of Pakistan.

The distribution table is shown below:

Module 1: Establish and Maintain the Occupational Health and Safety System 50 Hours	Module 4: Dis-assemble and Assemble Diesel Engine 170 Hours
Module 2: Perform Advance Communication 50 Hours	
Module 3: Perform Basic Machining Operations 180 Hours	Module 5: Perform Periodic Maintenance of Hauling Machines 150 Hours

Module 6: Troubleshooting of Crushing Plant 150 Hours	Module 8: Maintain the Power Generator 120 Hours
	Module 9: Maintain Hydraulic System 150 Hours
Module 7: Perform Basic Electrical Installations 150 Hours	Module 10: Perform Basic Green Skills for Crusher Plant 30 Hours

Summary – Overview of the Curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 1: Establish and Maintain the Occupational Health and Safety System Aim: After successful completion of this module, the trainee is competent in Establishing and Maintain the Occupational Health and Safety System	LU1: Carryout Risk assessment at workplace LU2: Follow emergency response protocol/procedure LU3: Perform safe storage and disposal of waste LU4: Maintain ergonomics condition at workplace	20	30	50
Module 2: Perform Advance Communication Aim: After successful completion of this module, the trainee is competent in performing Advance Communication	LU1: Describe Professional skills LU2: Plan and Organize work	20	30	50

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 3: Perform Basic Machining Operations Aim: After successful completion of this module, the trainee is competent in performing basic Machining Operations	LU1: Perform Mounting and Dressing of Grinding Wheel on surface Grinding machine LU2: Perform single point cutting Tool Grinding on Pedestal Grinder LU3: Perform Grinding LU4: Set Lathe machine for operation LU5: Perform Facing LU6: Perform Turning LU7: Perform Drilling/Boring LU8: Perform Arc Welding	30	150	180
Module 4: Disassemble and Assemble Diesel Engine Aim: After successful completion of this module, the trainee is competent in Disassembling and Assembling Diesel Engine	LU1: Disassemble Engine Head LU2: Disassemble Engine Block LU3: Assemble Engine block LU4: Assemble Engine Head	32	138	170

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 5: Perform Periodic Maintenance of Hauling Machines Aim: After successful completion of this module, the trainee is competent in Performing Periodic Maintenance of Hauling Machines	LU1: Service Hydraulic System LU2: Service Suspension System(Hauling) LU3: Service Drive Train (Hauling) LU4: Service Braking System (Hauling) LU5: Service the Cab LU6: Service Supporting Pneumatic (Air-filled) System	33	117	150
Module 6: Troubleshooting of Crushing Plant Aim: After successful completion of this module, the trainee is competent in Troubleshooting of Crushing Plant	LU1: Service of Spring and Cushions of Screen LU2: Service of Plant Cabin LU3: Service Conveyer LU4: Service Hopper and Feeder LU5: Service Crusher	18	132	150

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 7: Perform Basic Electrical Installations Aim: After successful completion of this module, the trainee is competent in Performing Basic Electrical Installations	LU1: Interpret Electrical layout LU2: Perform Basic Electric Circuits LU3: Perform three phase connection LU4: Perform Basic Electrical Measurements LU5: Provide Power Supply to machine	30	120	150
Module 8: Maintain the Power Generator Aim: After successful completion of this module, the trainee is competent in Maintaining the Power Generator	LU1: Perform Preventive Maintenance LU2: Troubleshoot of generator LU3: Troubleshoot of Control Panel	30	90	120

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 09: Maintain Hydraulic System Aim: After successful completion of this module, the trainee is competent in Maintaining Hydraulic System	LU1: Inspect hydraulic pump and control valve LU2: Replace hydraulic pump and motor LU3: Replace hydraulic pump and motor LU4: Overhaul hydraulic cylinder	18	132	150
Module 10: Perform Basic Green Skills for Crusher Plant Aim: After successful completion of this module, the trainee is competent in performing basic Green Skills for Crusher Plant	LU1: Manage sustainability of materials used at crushing plant LU2: Manage crushing plant waste	9	21	30

Modules

Module 1: Establish and Maintain the Occupational Health and Safety System

Objective of the module: The aim of this module to get knowledge, skills and understanding to establish, maintain and evaluate an occupational health and safety system in the work environment.

Duration: 50 hours **Theory:** 20 hours **Practical:** 30 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Carryout Risk assessment at workplace	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify potential hazards at workplace 2. Evaluate the risk 3. Take corrective/preventive action to mitigate the risk 4. Record your findings 5. Review the risk assessment 	<ul style="list-style-type: none"> • Recognize different types of hazards causing harm to workers. • Knowledge about health and safety precautions • Describe the methods to identify the risks and/or hazards at workplace • Knowledge about methods of dealing with hazard to avoid any accident or injury <p>Activity: Perform risk assessment at work place</p>	Total: 10hrs Theory: 5 hrs Practical: 8 hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board PPES marker <div>Non Consumable</div> <ul style="list-style-type: none"> • White board PPES • Multimedia • Computer 	<ul style="list-style-type: none"> • Class Room • Simulated environment
LU2: Follow emergency	The trainee will be able to:	<ul style="list-style-type: none"> • Explain different types of 	Total: 13 hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks 	<ul style="list-style-type: none"> • Class Room • Simulated

response protocol/procedure	<ol style="list-style-type: none"> 1. Identify emergency exits at workplace 2. Select suitable positions for the relevant equipment 3. Identify assembly area at workplace 4. Follow procedure and instructions to evacuate the building 5. Report immediately at designated assembly area in case of emergency 	<p>emergencies at work place</p> <ul style="list-style-type: none"> • Knowledge about emergency protocol/procedures for fire, hazardous chemical spillage, major power failure, terrorism activities and natural disasters • Understanding of current safety /emergency principles and practices at workplace <p>Activity: Perform mock drill for emergency response plan</p>	<p>Theory: 5hrs</p> <p>Practical: 8 hrs</p>	<ul style="list-style-type: none"> • Pencils • Erasers • Sharpeners • White board PPES marker <p>Non Consumable</p> <ul style="list-style-type: none"> • White board PPES • Multimedia • PPEs (Safety glasses, Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.) • Computer 	environment
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LU3: Perform safe storage and disposal of waste	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify different types of waste material 2. Identify types of containers to store the different types of waste material 3. Use required labels on storage containers 4. Store the waste materials according to standards 5. Identify types of waste bins 6. Dispose- off waste material according to the safety procedure 	<ul style="list-style-type: none"> • Explain different types of waste materials • Knowledge about methods of collecting and storing waste material • Describe types of waste bins • Knowledge about methods of safe disposal of waste material <p>Activity:</p> <ul style="list-style-type: none"> • Perform mock drill for collection and safe storage of waste material • Perform mock drill for safe disposal of waste material 	Total 12 hrs Theory: 5hrs Practical: 7 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Safety manuals/MS DS • Computer 	<ul style="list-style-type: none"> • Class Room • Simulated environment
LU4: Maintain ergonomics condition at workplace	The trainee will be able to: <ol style="list-style-type: none"> 1. Follow standard working posture/position at workplace 2. Follow standard procedure to provide sufficient light at workplace 	<ul style="list-style-type: none"> • Explain standard working posture/position at workplace • Explain standard procedure for sufficient light at workplace • Describe types of noises at workplace • Knowledge about types of hazardous waste • standard procedure for 	Total: 12 hrs Theory: 5 hrs Practical: 7 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board PPES marker 	<ul style="list-style-type: none"> • Class Room • Simulated environment

	<p>3. Use ergonomic workstations to avoid muscle fatigue</p> <p>4.</p>	<p>ventilation at workplace</p> <p>Activity:</p> <p>Practice of preparing ergonomic workstation</p>		<p>Non Consumable</p> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Computer 	
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Module2: Perform Advance Communication

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform basic communication.

Duration: 50 hours

Theory: 20

Practical: 30hours

hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Demonstrate Professional skills	The trainee will be able to: <ol style="list-style-type: none"> Demonstrate different modes of communication: <ul style="list-style-type: none"> Speaking Reading Writing Listening Demonstrate presentation skills through multimedia etc Develop CV according requirements Develop interview skills according to job requirement 	<ul style="list-style-type: none"> Explain modes of communication Describe different types of communication skills Explain advanced language skills Understanding of direct and indirect communication methods Describe different templates of CVs Knowledge about interview techniques <p>Activity:</p> <ul style="list-style-type: none"> Develop CV for the post of crushing plant technician/supervisor. Role-play, interview for the post of crushing plant operator and technician Present assigned job through multimedia followed by question answers session 	Total: 22hrs Theory: 7hrs Practical: 15hrs	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pen <p>Non Consumable</p> <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system 	<ul style="list-style-type: none"> Class Room

LU2: Plan and Organize work	The trainee will be able to: 1. Identify task requirements. 2. Plan steps to complete tasks 3. Review planning and organizing process 4. Organize work as per task requirement	<ul style="list-style-type: none"> • Knowledge about training skills • Understanding of Professionals skills • Describe the assessment and trainees feedback methods • Analyze the need of the training type at the work place <p>Activity: Prepare report to plan and organize work as per job assigned</p>	Total:13hrs Theory:7hrs Practical:6hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pen Non Consumable <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system 	<ul style="list-style-type: none"> • Class Room
LU3: Conduct Professional Activities Ethically	The trainee will be able to: 1. Identify the ethical problems 2. Identify affected parties and their interests 3. Evaluate each solution using the interest those involves	<ul style="list-style-type: none"> • Knowledge about professional ethics • Understanding about code of conduct • Explain the principles of professional ethics • Describe the importance of professional ethics • Explain different kind of ethical problems at workplace • Knowledge about ethical problem solving techniques 	Total:15hrs Theory:6hrs Practical:9hrs	<ul style="list-style-type: none"> • Notebooks • Pen <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system 	<ul style="list-style-type: none"> • Class Room

Module3: Perform Basic Machining Operations

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform basic machining operations

Duration: 180 hours **Theory:** 30 hours **Practical:** 150 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform Mounting and Dressing of Grinding Wheel on surface Grinding machine	The trainee will be able to: <ol style="list-style-type: none"> 1. Select grinding wheel according to material 2. Mount and dress grinding wheel as per standard procedure 3. Shut down machine after completion the task 	<ul style="list-style-type: none"> • Differentiate types of surface grinding machines • Describe specification of grinding wheels & their application • Illustrate dressing procedure of grinding wheel • Inspect defects of grinding wheel Activity: <ul style="list-style-type: none"> • Practice of installation of grinding wheel on pedestal grinder 	Total: 18hrs Theory: 3hrs Practical: 15hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Wheel dresser • Grinding Wheel • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system 	<ul style="list-style-type: none"> • Class Room / Work Shop

				<ul style="list-style-type: none"> • Pedestal Grinding Machine • PPEs 	
LU2: Perform single point cutting Tool Grinding on Pedestal Grinder	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform tool grinding operation by holding the tool firmly against the rotating wheel by placing it on the tool rest. 2. Dip tool in coolant at intervals to avoid over heating of the job. 3. Adopt technique and methods as per requirements of tool geometry 4. Check quality of tool at suitable intervals 5. Shut down grinder after finishing the work 	<ul style="list-style-type: none"> • Inspect tools & techniques • Differentiate between different types of work piece material & cutting tool • Illustrate tool types and tool geometry Activity: <ul style="list-style-type: none"> • Practice of grinding cutting tool according to the job requirement. 	Total: 18hrs Theory: 3hrs Practical: 15hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Grinding Wheel • HSS Tool bit • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Pedestal Grinding 	<ul style="list-style-type: none"> • Class Room / Work Shop

				Machine <ul style="list-style-type: none"> PPEs 	
LU3: Perform Grinding	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select clamping device according to the job requirement 2. Manage the measuring instruments as per job requirement 3. Switch ON the machine 4. Clamp the work piece as per standard procedure 5. Maintain safe distance between work piece & grinding wheel 6. Apply coolant on grinding surface 7. Perform grinding as per standard procedure 8. Clean & de burr the work piece 9. Verify dimensional and geometrical accuracy at suitable intervals 10. Shut down the machine in safe position after finishing the work 	<ul style="list-style-type: none"> Knowledge of clamping devices Explain the accuracy of measuring device Inspection techniques of grinding operations Knowledge of safety precautions in grinding activity Describe the types of coolants used in grinding activity <p>Activity:</p> <p>Practice of performing grinding on work piece</p>	<p>Total:24hrs</p> <p>Theory:4hrs</p> <p>Practical:20hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Round Bar Grinding Wheel Metal sheet White board PPES marker <p>Non Consumable</p> <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Pedestal Grinding Machine PPEs 	<ul style="list-style-type: none"> Class Room / Work Shop

LU4: Set Lathe machine for operation	The trainee will be able to: <ol style="list-style-type: none"> 1. Check oil levels 2. Switch ON the machine 3. Run machine warm-up cycle 4. Select tool & clamping device according to the job requirement. 5. Manage the measuring instruments as per job requirement. 	<ul style="list-style-type: none"> • Illustrate job drawings • Differentiate different types of lathe machines & their applications • Elaborate construction and working of lathe machine • Illustrate different types of attachment used in lathe machines • Differentiate clamping devices & procedures • Explain machine setting parameters Activity: <ul style="list-style-type: none"> • Practice of pre-operative setting of lathe machine. 	Total: 24hrs Theory: 4hrs Practical: 20hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • HSS/HCS Tool Bit • Round Bar <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Lathe Machine • PPEs 	<ul style="list-style-type: none"> • Class Room / Work Shop
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<p>LU5:</p> <p>Perform Facing</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Clamp and centre the work piece as per SOPs 2. Clamp the tool in tool post & set in required angle 3. Set machine parameter as per job specifications 4. Perform Facing operation by initial touching and adjust the depth of cut as per SOPs. 5. Check quality of the component at suitable intervals 6. Shut down the machine at safe position after finishing the work 	<ul style="list-style-type: none"> • Illustrate job drawings • Elaborate the facing • Knowledge about quality requirement for facing operation • Understand shut down procedure of machine <p>Activity:</p> <ul style="list-style-type: none"> • Practice of facing operation on work piece according to job / drawing. 	<p>Total:24hrs</p> <p>Theory:4hrs</p> <p>Practical:20hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • HSS/HCS Tool Bit • Round Bar <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Lathe Machine • PPEs 	<ul style="list-style-type: none"> • Class Room / Work Shop
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LU6: Perform Turning	The trainee will be able to: <ol style="list-style-type: none"> 1. Clamp and centre the work piece as per SOPs 2. Clamp the tool in tool post & set in required angle 3. Set machine parameter as per job specifications 4. Perform turning operation by initial touching and adjust the depth of cut as per SOPs. 5. Check quality of the component at suitable intervals 6. Shut down the machine at safe position after finishing the work 	<ul style="list-style-type: none"> • Illustrate job drawings • Elaborate turning. • Differentiate different types of turning <p>Activity:</p> <ul style="list-style-type: none"> • Practice of straight and taper turning operations on work piece according to job / drawing. 	Total:24hrs Theory:4hrs Practical:20hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • HSS/HCS Tool Bit • Round Bar • White board PPES marker <div>Non Consumable</div> <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Lathe Machine • PPEs 	<ul style="list-style-type: none"> • Class Room / Work Shop
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LU7: Perform Drilling/Boring	The trainee will be able to: <ol style="list-style-type: none"> 1. Clamp and centre work piece as per SOPs 2. Fit the drill bit in tail stock 3. Set machine parameter as per job specifications. 4. Perform drilling to produce appropriate hole size for boring as per SOPs. 5. Clamp the boring tool in the tool post. 	<ul style="list-style-type: none"> • Illustrate job drawings • Elaborate drilling / boring • Differentiate types of drilling /boring <p>Activity:</p> <ul style="list-style-type: none"> • Practice of drilling and boring operations of different diameter on lathe machine according to drawing. 	Total:24hrs Theory:4hrs Practical:20hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Drill Bit • Boring Tool • Round Bar • White board PPES marker <div>Non Consumable</div> <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Lathe Machine • Drill Bit Chuck • PPEs 	<ul style="list-style-type: none"> • Class Room / Work Shop
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<p>LU8:</p> <p>Perform Arc Welding</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Adjust welding parameters (current, voltage etc.) of welding plant 2. Maintain gap between electrode and base metal as per standard practices 3. Deposit root pass as per welding procedure specifications/job requirements 4. Deposit filling passes as per welding procedure specifications/job requirements 5. Deposit capping pass as per welding procedure specifications/job requirements 6. Remove slag after every pass with chipping hammer 7. Check root, filling and capping passes for any visual discontinuities as per acceptance standards 8. Clean work area in accordance with workplace safety practices 9. Maintain and store tools/equipment/consumable materials in accordance with organization guidelines 	<ul style="list-style-type: none"> • Illustrate job drawings • Elaborate specifications/ classification of electrode/s required for the job • Differentiate electrical parameters like (voltage, current etc.) and their effects on welding • Elaborate welding techniques as per WPS/instruction sheet • Elaborate welding procedure specifications (WPS) • Illustrate types of joints • Inspect the types of welding defects • Illustrate metal sheet gauges <p>Activity:</p> <ul style="list-style-type: none"> • Prepare different types of joints and remove slag with the help of chipping hammer. 	<p>Total:24hrs</p> <p>Theory:4hrs</p> <p>Practical:20hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Electrode • Mild steel strips • White board • PPES • marker <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Welding Transformer • Electrode holder • Conductor • Chipping Hammer • PPEs 	<ul style="list-style-type: none"> • Class Room / Work Shop
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Module 4: Disassemble and Assemble Diesel Engine

Objective of the module: The aim of this module to get knowledge, skills and understanding to disassemble and assemble diesel engine

Duration:170hours

Theory: 32hours

Practical: 138 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1:Disassemble Engine Head	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Remove valve cover ,intake and exhaust manifolds 3. Remove rocker arm from cylinder head 4. Remove cylinder head bolts 5. Remove valve lifter 6. Remove timing cover 7. Remove camshaft drive 8. Remove Head Gasket 9. Fill inspection check list 	<ul style="list-style-type: none"> • Elaborate engine terms • Illustrate engine components and its functions • Explain the engine head disassemble procedure. • Describe principle of four stroke engine • Explain the working principle of spark ignition engine and compression ignition engine Activity: <ul style="list-style-type: none"> • Practice to disassemble engine head as per engine manual 	Total: 35 hrs Theory: 5 hrs Practical: 30 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Erasers • Sharpeners • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Dummy diesel engine • Tool Kit • Torque 	<ul style="list-style-type: none"> • Class Room / Engine Shop

				wrench • Socket wrench set	
LU2. Disassemble Engine Block	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Disassemble the Piston and connecting rod 3. Disassemble the engine block according to manufacturing engine manual 4. Fill inspection check list 	<ul style="list-style-type: none"> • Elaborate engine lubrication system • Elaborate engine compression ignition system • Explain the engine block disassembles procedure. 	Total: 35 hrs Theory: 5 hrs Practical: 30 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Erasers • Sharpeners • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Dummy diesel engine • Tool Kit • Engine 	<ul style="list-style-type: none"> • Class Room / Engine Shop

				manual	
LU3. Assemble Engine block	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools and engine manual 2. Assemble the Ring and Piston and connecting rod 3. Assemble the engine block according to engine manual 4. Fill inspection check list. 	<ul style="list-style-type: none"> • Illustrate engine cooling system • Elaborate engine fuel system • Explain the engine head assemble procedure. 	Total: 50 hrs Theory: 11 hrs Practical: 39 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Erasers • Sharpeners • White board PPES marker • Nut and Bolts • Lubricant • Head Gasket • Seals • Hose pipes • Silicon Non Consumable <ul style="list-style-type: none"> • White board 	<ul style="list-style-type: none"> • Class Room / Engine Shop

				PPES <ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Dummy diesel engine • Tool Kit • Engine manual 	
LU4. Assemble Engine Head	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Install head gasket 3. Assemble camshaft drive 4. Assemble timing cover 5. Assemble valve lifter 6. Assemble cylinder head bolts 7. Assemble rocker arm in cylinder head 8. Assemble valve cover, intake and exhaust manifolds 	<ul style="list-style-type: none"> • Illustrate engine troubleshooting • Explain the engine block assembles procedure. 	Total: 50 hrs Theory: 11hrs Practical: 39 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Erasers • Sharpeners • White board PPES marker • Nut and Bolts • Lubricant • Head gasket • Seals • Hose pipes • Silicon 	<ul style="list-style-type: none"> • Class Room / Engine Shop

				<div>Non</div> <div>Consumable</div> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Dummy diesel engine • Tool Kit • Engine manual 	
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Module 5: Perform Periodic Maintenance of Hauling Machines

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform periodic maintenance of hauling machines

Duration:
150hours

Theory: 33hours

Practical: 117hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Service Hydraulic System	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Identify leakages and noise of the hydraulic system 3. Check hydraulic oil levels 4. Replace hoses/pipes 	<ul style="list-style-type: none"> Elaborate the functions of Mechanical Systems of hauling machines Explain the hydraulic system Inspect the hydraulic system components Knowledge about the tools used for the service of hydraulic system 	Total: 25 hrs Theory: 5 hrs Practical: 20 hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Hydraulic oil Control valves Hoses/ Pipes White board PPES marker 	<ul style="list-style-type: none"> Class Room / Work Shop
		Activity: <ul style="list-style-type: none"> Practice to inspect the hydraulic system components and replace the hoses/pipes. 		Non Consumable <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer 	

				system <ul style="list-style-type: none"> Hauling Machine 	
LU2: Service Suspension System(Hauling)	The trainee will be able to: <ol style="list-style-type: none"> Select tools Check gashes or bulges and tires lubricate bearings, bush and pins Change damaged grease fittings 	<ul style="list-style-type: none"> Illustrate Inspection & Maintenance of hauling machines and its associated attachments. Elaborate the suspension system Explain the inspection procedure of suspension system components 	Total: 25 hrs Theory: 5 hrs Practical: 20 hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Lubrication oil Bearings Bushes Fittings White board PPES marker Non Consumable <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Hauling Machine 	<ul style="list-style-type: none"> Class Room / Work Shop

				<ul style="list-style-type: none"> • Grease gun • Tool kit 	
LU3: Service Drive Train (Hauling)	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Check wear, leaks and damage to components 3. Identify defective undercarriage components 4. Repair / replace defective undercarriage components 	<ul style="list-style-type: none"> • Elaborate Inspection & Maintenance procedure of Mechanical Systems in hauling machines • Elaborate the drive train system • Explain the inspection procedure of drive train system components 	Total: 25 hrs Theory: 5 hrs Practical: 20 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Lubrication oil • Rollers • Bearings • Bushes • Leaf Spring • Shock Absorber • White board • PPES marker Non Consumable <ul style="list-style-type: none"> • White board • PPES 	Class Room / Work Shop

				<ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Hauling Machine 	
LU4: Service Braking System (Hauling)	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Top-up brake fluid reservoir 3. Identify defective components of braking system 4. Repair /replace defective components of braking system 	<ul style="list-style-type: none"> • Illustrate types of hauling machines • Elaborate the brake system • Explain the inspection procedure of brake system components 	Total: 25 hrs Theory: 6 hrs Practical: 19 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Hydraulic brake fluid • Brake Master cylinder • Pipes • Brake shoes • Brake disk • Caliber assembly • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board 	<ul style="list-style-type: none"> •

				PPES <ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Hauling Machine 	
LU5: Service the Cab	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify missing or defective components or controls 2. Clean front/rear wind screen, windows and mirrors 3. Adjust mirrors 4. Replace broken mirror/frame 5. Adjust seat and seat belt 6. Check knobs of all lights and indicators 	<ul style="list-style-type: none"> • Elaborate the cab • Describe the cab seat and seat belt • Explain the inspection procedure of cab components 	Total: 25 hrs Theory: 7hrs Practical: 18 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Switches • Sensors • Lights • White board Non Consumable <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Hauling 	Class Room / Work Shop

				Machine	
LU6: Service Supporting Pneumatic (Air-filled) System	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Perform basic maintenance of air compressor, choked drain and valves 3. Check and Replace damage seal, air lines and valves 	<ul style="list-style-type: none"> • Elaborate the pneumatic system • Explain the inspection procedure of pneumatic system components <hr/> Activity: <ul style="list-style-type: none"> • Practice to inspect, repair and replace the pneumatic system components 	Total: 25 hrs Theory: 5 hrs Practical: 20 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Air tank • Air Pipes • Compressor • Air check valve • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Hauling Machine 	Class Room / Work Shop

Module 6: Troubleshooting of Crushing Plant

Objective of the module: The aim of this module to get knowledge, skills and understanding to troubleshooting of crushing plant

Duration: 150 hours

Theory: 20hours

Practical: 130 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Service of Spring and Cushions of Screen	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Check and lubricate bearings, bush and pins 3. Check and replace greasing nipples 4. Check and replace spring and cushions 5. Check and replace the screen 	<ul style="list-style-type: none"> • Elaborate functions of Mechanical Systems of crushing plant • Differentiate inspection & Maintenance of crushing plant, and its associated Attachments. • Differentiate inspection & Maintenance procedure of Mechanical Systems in crushing plant • Describe types of crushing plant • Differentiate types of crushers • Elaborate components of crushers 	Total: 30hrs Theory: 4hrs Practical: 26hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board PPES marker <div>Non Consumable</div> <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Pen 	<ul style="list-style-type: none"> • Class Room/crushing plant site

		Activity: <ul style="list-style-type: none"> Practice to check, replace and lubricate the spring & cushions 		<ul style="list-style-type: none"> Crushing plant 	
LU2: Service of Plant Cabin	The trainee will be able to: <ol style="list-style-type: none"> Identify defective components / controls Clean wind screen Clean knobs of all lights and siren Check and replace the damage switches of control panel 	<ul style="list-style-type: none"> Elaborate the plant cabin Inspect the plant cabin components Describe the control panel 	Total: 30hrs Theory: 4hrs Practical: 26hrs	<div>Consumable</div> <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners White board PPES marker <div>Non Consumable</div> <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Crushing plant 	<ul style="list-style-type: none"> Class Room/ crushing plant site

LU3: Service Conveyor	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Check and lubricate bush and pins of rollers 3. Check and adjust the conveyor belt 4. Check and adjust the alignment of motors 5. Inspect the speed sensors with volt meter 6. Replace the damage sensors 7. Check and replace the damage components of conveyor 	<ul style="list-style-type: none"> • Illustrate components of conveyor belt • Elaborate the conveyor belt • Understanding about types of rollers • Explain speed sensors. Activity: <ul style="list-style-type: none"> • Practice to check, adjust, replace and lubricate the conveyor belt • Practice to replace damage sensors. 	Total:30hrs Theory:4hrs Practical:26hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board PPES marker Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system 	<ul style="list-style-type: none"> • Class Room /crushing plant site
LU4: Service Hopper and Feeder	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Lubricate bush and pins of hopper and feeder 3. Weld the damage parts 	<ul style="list-style-type: none"> • Differentiate different types of Hopper • Explain components of feeder • Elaborate components of control panel • Differentiate various types 	Total:30hrs Theory:3hrs Practical:27hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners 	<ul style="list-style-type: none"> • Class Room/ crushing plant site

		of screens		<ul style="list-style-type: none"> • Lubricants • Electrodes • White board PPES marker 	
		Activity: <ul style="list-style-type: none"> • Practice to lubricate the feeder and hopper • Practice to weld the damaged parts of hopper and feeder components 		<div>Non</div> <div>Consumable</div> <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Crushing plant • Tool kit • Grease gun • Welding plant 	

LU5: Service Crusher	The trainee will be able to: <ol style="list-style-type: none"> 1. Select tools 2. Inspect the connecting rod and crushing jaws 3. Tight nuts and flange 4. Replace with new bearing 5. Replace with new shaft 	<ul style="list-style-type: none"> • Differentiate various types of crushing plant • Illustrate components of crushers • Explain components of Electrical system • Describe components of hydraulic system and pneumatic system • Elaborate specifications (shape, types and sizes) of belts • Describe replacement techniques of bearings • Describe specifications (Number) of bearings and their uses <p>Activity:</p> <ul style="list-style-type: none"> • Practice to inspect and replace the components of crusher • Practice of tightening the nuts and bolts of crusher with proper torque. 	Total:30hrs Theory:3hrs Practical:27hrs	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • White board marker <p>Non</p> <p>Consumable</p> <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system 	<ul style="list-style-type: none"> • Class Room /crushing plant site
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Module7: Perform Basic Electrical Installations

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform basic electrical installations

Duration: 150hours

Theory: 30hours

Practical: 120hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Interpret Electrical layout	The trainee will be able to: <ol style="list-style-type: none"> 1. Interpret layout of the job for installations 2. Interpret electrical drawing for electrical wirings 3. Connect components of equipment according to drawing 	<ul style="list-style-type: none"> • Illustrate electrical symbols to be used in drawings • State different type of electrical wire gauges and insulation. • Elaborate AC and DC Current • Describe Ohm's Law and Kirchhoff Law. • Explain electrical circuit diagram • Explain layout of electrical components in circuit diagram 	Total: 26 hrs Theory: 6 hrs Practical: 20 hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Insulation tape • Electrical wire of different color code and gauges • White board marker 	Class Room/workshop
		Activity: <ul style="list-style-type: none"> • Practice to interpret electrical circuit diagram and layout of the job. • Practice of connecting electrical components as per circuit diagram 		Non Consumable <ul style="list-style-type: none"> • White board PPES • Multimedia • Internet • Computer system • Electrical Circuit Board 	

				<ul style="list-style-type: none"> • Multi meter • Wire cutter • Wire clipper • Continuity tester 	
LU2: Perform Basic Electric Circuits	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare series circuit on work bench 2. Prepare parallel circuit on work bench 3. Prepare Head and Tail Light Circuit on work bench 4. Prepare indicator circuit on work bench 	<ul style="list-style-type: none"> • Describe electrical connection scheme of the job • Elaborate handling techniques for placement for electrical equipment • Describe parallel and series circuit. 	Total: 26 hrs Theory: 6 hrs Practical: 20 hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Insulation tape • Electrical wire of different color code and gauge • White board marker • Cable clips • Spring push connectors <div>Non Consumable</div>	Class Room/workshop

				<ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Electrical Circuit Board • Multi meter • Wire cutter • Wire clipper 	
LU3: Perform three phase connection	The trainee will be able to: <ol style="list-style-type: none"> 1. Select cable gauge 2. Select cables colors 3. Connect cables 4. Insulate Joints 	<ul style="list-style-type: none"> • Elaborate methods of installing the electrical appliances. • Describe different methods of cable testing • Describe different types of coding procedures (e.g. color coding / tagging / numbering) 	Total: 36 hrs Theory: 6 hrs Practical:	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Insulation tape • Electrical wire of different 	Class Room/workshop

		Activity: <ul style="list-style-type: none"> Practice of power supply connection to the three phase motor as per circuit diagram 	30 hrs	color code and gauge <ul style="list-style-type: none"> White board marker Non Consumable <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Electrical Circuit Board Multi meter Wire cutter Wire clipper 	
LU4: Perform Basic Electrical Measurements	The trainee will be able to: <ol style="list-style-type: none"> Measure voltage Measure current Measure resistance Test continuity 	<ul style="list-style-type: none"> Describe Voltage, Current, Resistance and Continuity of current Differentiate between earthing and testing procedures Elaborate working principle of earth tester Elaborate L.C.R meter 	Total: 36 hrs Theory: 6 hrs Practical: 30 hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Insulation tape Electrical wire of different color code 	Class Room/workshop

		Activity: <ul style="list-style-type: none"> Practice to measure Voltage, Current, Resistance and Continuity in circuit 		and gauge <ul style="list-style-type: none"> White board marker Non Consumable <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Electrical Circuit Board Multi meter Wire cutter Wire clipper Continuity tester 	
LU5: Provide Power Supply to machine	The trainee will be able to: <ol style="list-style-type: none"> Select electrical appliances Connect cables with electrical appliances as 	<ul style="list-style-type: none"> Describe different methods of installing the electrical appliances Explain earthing , earthing points and its procedures explain working principle of earth tester 	Total: 26 hrs Theory: 6 hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Insulation tape 	Class Room/workshop

	<p>per operation manual</p> <p>3. Verify the connections according to color coding / tagging / numbering.</p> <p>4. Check the connectivity of earthing point.</p>	<p>Activity:</p> <ul style="list-style-type: none"> Practice to connect power supply with machine as per circuit diagram 	<p>Practical:</p> <p>20 hrs</p>	<ul style="list-style-type: none"> Electrical wire of different color code and gauge White board marker Earthing wire <p>Non Consumable</p> <ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Electrical circuit board Multi meter Wire cutter Wire clipper Power supply 	
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Module 8: Maintain Power Generator

Objective of the module: The aim of this module to get knowledge, skills and understanding to maintain power generator

Duration: 120 hours **Theory:** 30 hours **Practical:** 90 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform Preventive Maintenance	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Perform daily maintenance of Engine 2. Perform periodic maintenance of engine. 3. Perform alternator preventive maintenance 	<ul style="list-style-type: none"> • Elaborate Preventive maintenance of generator • Explain Preventive maintenance of alternator 	<p>Total:40hrs</p> <p>Theory:10hrs</p> <p>Practical:30hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Insulation tape • Electrical wire of different color code and gauge • White board marker <p>Non Consumable</p>	Classroom/ Workshop

		Activity: <ul style="list-style-type: none"> Practice of preventive and periodic maintenance of generator set. 		<ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Generator Multi meter Wire cutter Wire clipper Circuit continuity tester Star Kit 	
LU2: Troubleshoot of generator	The trainee will be able to: <ol style="list-style-type: none"> 1. Check stator, rotor, exciter, rectifiers 2. Replace rectifier and exciter 3. Check and replace cooling fan 4. Check and replace starting solenoid valve 5. Replace AVR (automatic voltage regulator) 	<ul style="list-style-type: none"> Elaborate different parts of generator Explain different parts of alternator Describe load test of alternator Explain different type of load test of alternator Explain automatic starting solenoid valve. Explain solenoid valve Explain AVR(Automatic 	Total: 40hrs Theory: 10hrs Practical: 30hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Insulation tape Electrical wire of different color code and gauge White board marker 	Classroom/ Workshop

		voltage regulator)		Non Consumable	
		Activity: <ul style="list-style-type: none"> Practice to identify faults of generator and rectify. Practice to replace cooling fan, rectifier, exciter and AVR. 		<ul style="list-style-type: none"> White board PPES Multimedia Internet Computer system Generator Multi meter Wire cutter Wire clipper Circuit continuity tester Star Kit solenoid valve AVR(Automatic voltage regulator) 	

LU3: Troubleshoot of Control Panel	The trainee will be able to: <ol style="list-style-type: none"> 1. Check and replace switches 2. Check and replace wires 3. Check and replace fuses 	<ul style="list-style-type: none"> • Differentiate different components of control panels • Explain the procedure to check and replace the switches, wire and fuses. Activity: <ul style="list-style-type: none"> • Practice to trace faults of control panel and rectify • Practice to replace wires, fuses and switches of control panel 	Total:40hrs Theory:10hrs Practical:30hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Insulation tape • Electrical wire of different color code and gauge • White board marker • Fuses • Wires • Switches • Non Consumable <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Generator • Multi meter • Wire cutter • Wire clipper 	Classroom/ Workshop
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				<ul style="list-style-type: none">• Circuit continuity tester• Star Kit	
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Module 9: Maintain Hydraulic System

Objective of the module: The aim of this module to get knowledge, skills and understanding to maintain hydraulic system

Duration: 150 hours **Theory:** 18 hours **Practical:** 132hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Inspect hydraulic pump and control valve	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Check the set-pressure and compare with standard value 2. Measure the flow rate and compare with standard value 3. Inspect and adjust proportional pressure control (PPC) valve as per requirement 	<ul style="list-style-type: none"> • Explain principle of hydraulic pump. • Elaborate nomenclature of hydraulic pump. • Differentiate various types of hydraulic pump • Differentiate various types of valves • Define structure, function and operation of proportional pressure control (PPC) valve. • Describe PPC valve and its working <p>Activity:</p> <ul style="list-style-type: none"> • Practice to inspect the hydraulic pump and hydraulic control valve assembly • Practice to check and adjust the different pressures of hydraulic control valve assembly 	<p>Total:35hrs</p> <p>Theory:05hrs</p> <p>Practical: 30hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Sharpener • Eraser • White board marker <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • Hydraulic system 	Classroom/ Hydraulic shop

LU2: Replace hydraulic pump and motor	The trainee will be able to: <ol style="list-style-type: none"> 1. Remove hydraulic pipes of pump and motor 2. Remove hydraulic pump and motor from hydraulic unit 3. Install hydraulic pump and motor to hydraulic unit 4. Install hydraulic pipes of pump and motor 	<ul style="list-style-type: none"> • Differentiate between hydraulic pump and motor • Describe Relief recess, floating bush, side bush, radial clearances and pressure balancing groove. • Explain effects of discharge pressure, running clearances and viscosity/oil temperature on the pump capacity • Describe deterioration of pump Activity: <ul style="list-style-type: none"> • Practice to check and replace the hydraulic pump and motor 	Total: 35hrs Theory: 05hrs Practical: 30hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Sharpener • Eraser • White board marker Non Consumable <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet Computer system Hydraulic system	Classroom/ Hydraulic shop
LU3: Replace hydraulic control valve	The trainee will be able to: <ol style="list-style-type: none"> 1. Remove hydraulic pipes of control valve 2. Remove hydraulic control valve 3. Install hydraulic pipes to control valve 4. Install hydraulic valve on hydraulic 	<ul style="list-style-type: none"> • Describe the hydraulic control vale • Explain the procedure to inspect and replace the hydraulic control valve • Explain the procedure to check the pressure of hydraulic oil in control valve • Differentiate various types of control valve 	Total: 35hrs Theory: 03hrs Practical: 32hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Sharpener • Eraser • White board marker 	Classroom/ Hydraulic shop

	unit	<p>used in hydraulic system</p> <ul style="list-style-type: none"> Describe Pilot pressure to operate the spools 		<p>Non Consumable</p> <ul style="list-style-type: none"> White board PPES Multimedia Internet <p>Computer system Hydraulic system</p>	
		<p>Activity:</p> <ul style="list-style-type: none"> Practice to check and adjust the different pressures of hydraulic control valve assembly Practice to replace the hydraulic control valve assembly Practice to draw circuit diagram. 			
<p>LU4:</p> <p>Overhaul hydraulic cylinder</p>	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> Disassemble the hydraulic cylinder Replace dust seal Replace U-packing Replace V-packing Replace piston "O" rings Assembling of hydraulic cylinder 	<ul style="list-style-type: none"> Explain Hydraulic cylinder Differentiate various types of hydraulic cylinder Differentiate various components of hydraulic cylinder Describe function and structure of each component of hydraulic cylinder piston ring, wear ring, U-packing, V-packing and dust seal. Explain the location, structure and function of quick drop valve 	<p>Total:45hrs</p> <p>Theory:05hrs</p> <p>Practical:40hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pencils Sharpener Eraser White board marker <p>Non Consumable</p> <ul style="list-style-type: none"> White board PPES 	<p>Classroom/ Hydraulic shop</p>

		Activity: <ul style="list-style-type: none"> • Practice to disassemble the hydraulic cylinder • Practice to check and replace the different components of hydraulic cylinder. • Practice to assemble the hydraulic cylinder 		<ul style="list-style-type: none"> • Multimedia • Internet Computer system Hydraulic system	
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Module 10: Perform Basic Green Skills for Crusher Plant

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform basic green skills for crusher plant.

Duration: 30 hours **Theory:** 10 hours **Practical:** 20 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Manage sustainability of materials used at crushing plant	<p>The trainee will be able to:</p> <ol style="list-style-type: none"> 1. Select sustainable raw materials as per requirement 2. Follow standard procedure to manage systems (waste, energy, water) 3. Perform impact quantification of used material at crushing plant 	<ul style="list-style-type: none"> • Environmental degradation • Types of raw materials at crushing plant • Types of waste • Waste reduction techniques • Concept of 6 R approach (Reduce, Reuse, Recycle, Repair, Renew, and Rethink) • Reusable materials • Recyclable materials • Methods for disposal of unusable materials • Just-in-time (JIT) approach 	<p>Total:15hrs</p> <p>Theory:05hrs</p> <p>Practical:10hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pen <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system 	Classroom/ working site

		<ul style="list-style-type: none"> • Basic knowledge of green energy resources (solar, biogas, natural light, rainwater, wind energy etc.) 			
LU2: Manage crushing plant waste	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify various types of waste at site 2. Sort and categorize reusable waste 3. Dispose unusable waste as per set standards 4. Place reusable material at designated storage area 5. Transport waste material to designated place 	<ul style="list-style-type: none"> • Environmental degradation • Types of raw materials at crushing plant • Types of waste • Waste reduction techniques • Concept of 6 R approach (Reduce, Reuse, Recycle, Repair, Renew, and Rethink) • Reusable materials • Recyclable materials • Methods for disposal of unusable materials • Just-in-time (JIT) approach • Basic knowledge of green energy resources (solar, biogas, natural light, rainwater, wind energy etc.) 	Total: 15hrs Theory: 05hrs Practical: 10hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pen Non Consumable <ul style="list-style-type: none"> • White board • PPES • Multimedia • Internet • Computer system • 	Classroom/ working site

General assessment guidance for Crushing Plant Technician/Supervisor

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments, combined to produce the final qualification result.

Sessional assessment is going on all the time. Its purpose is to provide feedback on what students are learning:

- To the student: to identify achievement and areas for further work
- To the teacher: to evaluate the effectiveness of teaching to date, and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

Final assessment is the assessment, usually on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is usually fairly formal. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assume considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment of a Crushing Plant Technician/Supervisor include:

- Work performances, for example perform basic communication, maintain personal health, hygiene and safety and perform basic computer operations
- Demonstrations, for example Perform Basic Machining Operations

- Direct questioning, where the assessor would ask the student how to establish and maintain the occupational health and safety system, how they can communicate at work place and how they can perform basic electrical installations
- Paper-based tests, such as multiple choice or short answer questions on communication at work place, basic electrical installations
- Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of a Crushing plant technician /Supervisor include:

- Work products, such as maintaining power generator, assembling and disassembling of diesel engine

Indirect assessment should only be a second choice. (In some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that a valid assessment assesses what it claims to assess. For example, if troubleshooting of crushing plant and periodic maintenance of hauling machines are to be assessed and certificated, the assessment should involve performance criteria that are directly related to that documentation activity. An interview about the troubleshooting of crushing plant and periodic maintenance of hauling machines would not meet the performance criteria.

Reliability means that the assessment is consistent and reproducible. For example, if the work performance of preparing documents in words has been assessed, another assessor (e.g. the future employer) should be able to see the same work performance and witness the same level of achievement.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the students' needs.

Assessment strategy for Crushing Plant Technician/Supervisor

This curriculum consists of 10 modules:

- **Module 1:** Establish and Maintain the Occupational Health and Safety System
- **Module 2:** Perform Advance Communication
- **Module 3:** Perform Basic Machining Operations
- **Module 4:** Disassemble and Assemble Diesel Engine
- **Module 5:** Perform Periodic Maintenance of Hauling Machines
- **Module 6:** Troubleshooting of Crushing Plant
- **Module 7:** Perform Basic Electrical Installations
- **Module 8:** Maintain the Power Generator
- **Module 9:** Maintain Hydraulic System
- **Module 10:** Perform Basic Green Skills for Crusher Plant

Sessional assessment

The sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The sessional marks shall contribute to the final qualification.

Theoretical assessment for all learning modules must consist of a written paper lasting at least one hour per module. This can be a combination of multiple choice and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final assessment

Final assessment shall be in two parts: theoretical assessment and practical assessment. The final assessment marks shall contribute to the final qualification.

The assessment team

The number of assessors must meet the needs of the students and the training provider. For example, where two assessors are conducting the assessment, there must be a maximum of five students per assessor. In this example, a group of 25 students shall therefore require assessments to be carried out over a four-day period. For a group of only 10 to 15 students, assessments would be carried out over a two-day period only.

Planning for assessment

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. The tables on the following pages are for assessors to use to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules into a cohesive two-day final assessment programme for each group of five students. Training providers must agree the content for practical assessments in advance.

Complete list of tools and equipment

Sr #	Description	Quantity
1.	Computer Systems	26
2.	Scanner	1
3.	Printer	1
4.	Hardness Testers	1
5.	Universal testing machine(UTM)	1
6.	Impact Testing Machines	1
7.	Steel Rulers	10
8.	Tri Square	10
9.	Inside Vernier Caliper	10
10.	Odd leg Vernier Caliper	10
11.	Trammel Vernier Caliper	10
12.	Outside Vernier Caliper	10
13.	Vernier Depth gauge	5

14.	Vernier Bevel protractor	5
15.	Thread gauges	5
16.	Screw pitch gauges	5
17.	Fillet gauges	5
18.	Feeler gauges	5
19.	Vernier Height gauge	5
20.	Dial indicators with magnetic stand	5
21.	Vernier Micrometer	5
22.	Inside Micrometer	5
23.	Outside Micrometer	10
24.	Depth Micrometer	5
25.	Snap Gauge set	2
26.	Dial Bore Gauge	5
27.	Set of Adjustable Wrench	5
28.	Set of Spanners (Open end, Ring)	5 each
29.	Pipe wrench	2

30.	L-key sets	5
31.	Nose pliers	5
32.	Grip pliers	5
33.	Wrenches	5
34.	Pliers	5
35.	Screw driver (Positive and negative)	5
36.	Hammer	5
37.	Vice grip	5
38.	Grease gun	5 each
39.	Paint brush	10
40.	Steel brush	25
41.	Measuring tape	10
42.	Hopper	10
43.	Conveyor	10
44.	Torque gauge	5
45.	Steel rule	5

46.	Multi-meter	5
47.	Thermometers	5
48.	Spanner set	10 packs
49.	Socket set	1
50.	Star Kit	1
51.	ST(special service Tool)	1
52.	Drilling Machines	1
53.	Location Determining Devices	1
54.	Digging slant determining devices	1
55.	Communication Devices	10
56.	Sample Boxes	10
57.	Exploration and Scanning Devices	2
58.	Drawing board	25
59.	Lathe Machine	05
60.	Welding Plant	05
61.	Crush Plant	01

62.	Wheel Loader	02
63.	Dumper	02

List of consumable supplies		
Sr no	Material	Quantity
1.	Note book	25
2.	Pencil	25
3.	White sheets	25
4.	Eraser	25
5.	Sharpener	25
6.	Pen	25
7.	Cleaning brush	25
8.	Cotton rags	1KG
9.	PPE's	25
10.	Lubricants	In Litters
11.	Grease	In Kg

12.	Electric Wire of different color coding	6
13.	sensors	10
14.	Indicator bulbs	10
15.	Hydraulic Oil	In Liter
16.	Diesel	In Liter
17.	AVR (Auto Voltage Regulator)	5
18.	Hydraulic system Hoses and Pipes	15
19.	Round Bar	30 Kg
20.	Lath Machine Tool	15
21.	Drill Bit Set	5

Credit values

The credit value of the National Certificate Level 4 in Crushing Plant Technician/Supervisor is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines).

The credit values are as follows:

Modules	Estimate of hours	Credit
A. Establish and Maintain the Occupational Health and Safety System	50	5
B. Perform Advance Communication	50	5
C. Perform Basic Machining Operations	180	18
D. Disassemble and Assemble Diesel Engine	170	17
E. Perform Periodic Maintenance of Hauling Machines	150	15
F. Troubleshooting of Crushing Plant	150	15
G. Perform Basic Electrical Installations	150	15
H. Maintain the Power Generator	120	12
I. Maintain Hydraulic System	150	15

Modules	Estimate of hours	Credit
J. Perform Basic Green Skills for Crusher Plant	30	3