

Curriculum For “Digging Operation /Technology”

(Assistant Operational Supervisor)

(Level -4)



25th to 29th October 2021



**National Vocational & Technical
Training Commission**

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Introduction

Definition/ Description of the Training Programme for *Digging Operation Technology*

There is an increasing demand of the Digging Operation Supervisor in civil construction or mining industry. If an individual is planning to pursue a career in Digging or Excavation, this program will be helpful in targeting various industries including civil construction or mining, etc.

Purpose of the Training Programme

The purpose of this training is to develop a range of skills and techniques, personal skills and attributes essential for successful performance in civil construction or mining sector in accordance with industry requirements. Graduates 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 graduates through qualifying job-related training in the Digging/Excavation 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

- **A**-Establish and maintain the occupational Health and safety system
- **B**-Perform Advance communication
- **C**-Analyse Workplace Policies and Procedures
- **D**-Maintain Electrical System of Equipment
- **E**-Maintain Mechanical System of Equipment
- **F**-Maintain Hydraulic System of Equipment
- **G**-Develop Preliminary Project Plan
- **H**- Perform Advance Digging/Excavation Operations
- **I**-Perform 2D – 3D Engineering Drawings using CAD Software

Possible Available Job Opportunities Available Immediately and Later In The Future

- Digger Operator
- Engine Mechanic
- Auto Electrician

Trainee Entry Level

This national vocational qualification (NVQ) has been validated by the Qualifications Development Committee (QDC) in 25th to 29th Jan, 2021 and will remain in currency until 20th Jan 2031.

Minimum Qualification of Trainer

Teaching staff should have DAE with two years' or 2 years Certificate with five years' experience in Digging/Excavation. They should also hold or be working towards a formal teaching qualification.

Other formal qualifications in the Civil Construction or Mining 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 15 modules. The recommended delivery time is 600 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 follow:

Module	Theory ¹ Days/hours	Workplace ² Days/hours	Total hours
Module 1: A-Establish and maintain the occupational Health and safety system	10	20	30
Module 2: B-Perform Advance communication	10	20	30
Module 3: Analyse Workplace Policies and Procedures	10	20	30
Module 4: Maintain Electrical System of Equipment	20	100	120
Module 5: Maintain Mechanical System of Equipment	30	30	160
Module 6: Maintain Hydraulic System of Equipment	20	120	140
Module 7: Develop Preliminary Project Plan	40	210	250
Module 8: Perform Advance Digging/Excavation Operations	50	270	320
Module 9: Perform 2D – 3D Engineering Drawings using CAD Software	20	100	120

¹ Learning Module hours in training provider premises

² Training workshop, laboratory and on-the-job workplace

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 30 Hours	Module 2: Perform Advance communication 30 Hours	
	Module 4: Maintain Electrical System of Equipment 120 Hours	Module 5: Maintain Mechanical System of Equipment 160 Hours
	Module 6: Maintain Hydraulic System of Equipment 140 Hours	Module 7: Develop Preliminary Project Plan 250 Hours
Module 3: Analyse Workplace Policies and Procedures 30 Hours	Module 8: Perform Advance Digging/Excavation Operations 320 Hours	
	Module 9: Perform 2D – 3D Engineering Drawings using CAD Software 120 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 Maintaining the Occupational Health and Safety System	LU1: Organise consultation process LU2: Design Occupational Health and Safety framework LU3: Design and implement an Occupational Health and Safety awareness training program LU4: Establish, monitor and maintain Occupational Health and safety system LU5: Establish and maintain a system for accident investigation LU6: Evaluate the organization's Occupational Health and Safety system and related policies procedures and programs	10	20	30
Module 2: Perform Advance Communication Aim: After successful completion of this module, the trainee is competent in performing Advance Communication	LU1: Demonstrate professional skills LU2: Plan and Organize work LU3: Provide trainings at workplace	10	20	30

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 3: Analyse Workplace Policy and Procedures Aim: After successful completion of this module, the trainee is competent in Analysing Workplace Policy and Procedures	LU1: Manage work timeframes LU2: Manage to convene meeting LU3: Set and meet own work priorities at instant LU4: Develop and maintain professional competence LU5: Follow and implement work safety requirements	10	20	30
Module 4: Maintain Electrical System of Equipment Aim: After successful completion of this module, the trainee is competent in maintaining Electrical System of Equipment	LU1: Maintain Starting System LU2: Maintain Charging System LU3: Maintain Electrical Power System LU4: Maintain Wiring of Equipment	20	100	120

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 5: Maintain Mechanical System of Equipment Aim: After successful completion of this module, the trainee is competent in maintaining Mechanical System of Equipment	LU1: Maintain Intake and exhaust System LU2: Maintain cooling System LU3: Maintain fuel system LU4: Maintain Lubrication System	30	130	160
Module 6: Maintain Hydraulic System of Equipment Aim: After successful completion of this module, the trainee is competent in maintaining Hydraulic System of Equipment	LU1: Maintain Swing System LU2: Maintain Work equipment system LU3: Maintain Travel System LU4: Maintain Open Load Sensing System (OLSS)	20	120	140

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 7: Develop a Preliminary Project Plan Aim: After successful completion of this module, the trainee is competent in developing a Preliminary Project Plan	LU1: Perform Survey of Area LU2: Prepare Estimate LU3: Prepare the plan of project features LU4: Prepare feasibility report	40	210	250
Module 8: Perform Advance Digging/Excavation Operations Aim: After successful completion of this module, the trainee is competent in performing Advance Digging/Excavation Operations	LU1: Prepare Trenches LU2: Perform Geometrical Shapes Excavation LU3: Perform different types of excavations	50	270	320

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 9: Perform 2D Engineering Drawings using CAD Software Aim: After successful completion of this module, the trainee is competent in performing 2D Engineering Drawings using CAD Software	LU1: Draw 2D shapes LU2: Prepare final sets of 2D drawings LU3: Develop 3D Objects LU4: Manipulate 3D objects using 3D Editing Tools LU5: Render 3D Model	20	100	120

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 maintain personal health, hygiene and safety

Duration: 30hours

Theory: 20 hours

Practical: 10 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Organise consultation process	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify and invite relevant personnel or other representative personnel into the development and maintenance processes. 2. Handle issues raised through consultation according to issue resolution procedures. 3. Verify results from the consultation process and makes it available to relevant personnel. 	<ul style="list-style-type: none"> • Identify and invite relevant personnel or other representative personnel into the development and maintenance processes. • Handle issues raised through consultation according to issue resolution procedures. • Verify results from the consultation process and makes it available to relevant personnel. 	Total: 05hrs Theory: 03hrs Practical: 01hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class room
LU2: Design Occupational Health and Safety framework	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify hazards and risks correctly and confirm according to occupational health and safety legislation, 	<ul style="list-style-type: none"> • Identify hazards and risks correctly and confirm according to occupational health and safety legislation, codes of 	Total: 05hrs Theory: 03hrs Practical: 01hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners 	Class room

	<p>codes of practice and prevailing trends.</p> <ol style="list-style-type: none"> 2. Develop procedure for ongoing identification of hazards and risks and integrated within work systems and procedures 3. Develop occupational health and safety policies line with relevant legislation. 4. Incorporate and define occupational health and safety responsibilities and duties into job descriptions/statements. 5. Provide adequate resources in a timely and consistent manner. 6. Develop and implement measures to control assessed risks in accordance with the hierarchy of control, relevant occupational health and safety legislation, codes of practice and trends. 	<p>practice and prevailing trends.</p> <ul style="list-style-type: none"> • Develop procedure for ongoing identification of hazards and risks and integrated within work systems and procedures • Develop occupational health and safety policies line with relevant legislation. • Incorporate and define occupational health and safety responsibilities and duties into job descriptions/statements. • Provide adequate resources in a timely and consistent manner. • Develop and implement measures to control assessed risks in accordance with the hierarchy of control, relevant occupational health and safety legislation, codes of practice and trends. • Implement interim solutions until a permanent control measure. 		<p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • PPEs (Safety glasses, Ear muffs/ear plugs, Protective Gloves, Cap, Safety shoes etc.) 	
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	<p>7. Implement interim solutions until a permanent control measure.</p> <p>8. Record details clearly and efficiently according to organisation policy and procedures and relevant legislation</p>	<ul style="list-style-type: none"> Record details clearly and efficiently according to organisation policy and procedures and relevant legislation 			
LU3: Design and implement an Occupational Health and Safety awareness training program	<p>The trainee will be able to:</p> <p>1. Communicate procedures to help implement workplace policy</p> <p>2. Inform those involved in implementing the policy about expected outcomes, activities to be undertaken and assigned responsibilities</p>	<ul style="list-style-type: none"> Devise educational information on the occupational health and safety system and make it available to all relevant personnel. Provide appropriate training to all relevant personnel to enable the implementation of safety procedures 	<p>Total: 05hrs</p> <p>Theory: 03hrs</p> <p>Practical: 02hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> White board Multimedia Internet Computer system Safety manuals 	Class room
LU4: Establish, monitor and maintain Occupational Health and safety system	<p>The trainee will be able to:</p> <p>1. Establish a system for keeping occupational health and safety records in accordance with legislative</p>	<ul style="list-style-type: none"> Establish a system for keeping occupational health and safety records in accordance with legislative 	<p>Total: 06hrs</p> <p>Theory: 04hrs</p> <p>Practical: 02hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners 	Class room

	<p>requirements.</p> <p>2. Work activities are monitored to ensure that hazard identification and risk assessment and control procedures are effectively adopted.</p> <p>3. Inadequacies in hazard identification, risk assessment and established risk control measures are identified in accordance with the hierarchy of control and reported to designated personnel.</p> <p>4. Amendments to procedures are undertaken through appropriate consultation methods</p>	<p>requirements.</p> <ul style="list-style-type: none"> • Work activities are monitored to ensure that hazard identification and risk assessment and control procedures are effectively adopted. • Inadequacies in hazard identification, risk assessment and established risk control measures are identified in accordance with the hierarchy of control and reported to designated personnel. • Amendments to procedures are undertaken through appropriate consultation methods 		<p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	
<p>LU5: Establish and maintain a system for accident investigation</p>	<p>1. A system is developed and implemented for reporting and investigation of all accidents/incidents in accordance with the policies and procedures.</p>	<ul style="list-style-type: none"> • Explain the system for reporting and investigation of all accidents/incidents according to the policies and procedures. 			

	<p>2. Training is provided to employees responsible for accident investigation for effective implementation of accident investigation policy.</p> <p>3. Policies and procedures for reporting and investigating all accidents/incidents are reviewed and updated as required</p>	<ul style="list-style-type: none"> • Importance of training to employees responsible for accident investigation • Describe the policies and procedures for reporting and investigating all accidents/incidents 			
<p>LU6: Evaluate the organization's Occupational Health and Safety system and related policies procedures and programs</p>	<p>1. The effectiveness of the occupational health and safety system and related policies, procedures and programs is assessed according to the organization's occupational health and safety policy.</p> <p>2. Improvements to the occupational health and safety system are developed and implemented.</p> <p>3. Compliance with occupational health and safety legislation and codes of practice is assessed to</p>	<ul style="list-style-type: none"> • Importance of occupational health and safety system and related policies, procedures and programs according to the organization 	<p>Total: 06hrs Theory: 04hrs Practical: 02hrs</p>	<p>Consumable</p> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class room

	ensure that legal occupational health and safety standards are maintained				
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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: 30 hours

Theory: 10 hours

Practical: 20 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"> Use different modes of communication to communicate <ul style="list-style-type: none"> Speaking Reading Writing Listening Presentation Visual representation etc. Develop CV Skills according requirements Upgrade professional skills by attending trainings, webinars, conferences etc. Perform Continuous professional development as required at workplace Develop interview skills 	<ul style="list-style-type: none"> Importance of different modes of communication to communicate Describe skills for CV <ul style="list-style-type: none"> Creativity. Interpersonal Skills. Critical Thinking. Problem Solving. Public Speaking. Customer Service Skills. Teamwork Skills. Communication, etc. Importance of hard skills 	Total: 11hrs Theory: 04hrs Practical: 07hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Non Consumable <ul style="list-style-type: none"> White board Multimedia Internet Computer system 	Class room

LU2: Plan and Organize work	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify task requirements. 2. Plan steps to complete tasks. 3. Review planning and organizing process. 4. Organize work. 	<ul style="list-style-type: none"> • Importance of task requirements. • Describe the planning and organizing process 	Total: 10hrs Theory: 03hrs Practical: 07hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Pen 	Class room
LU3: Provide trainings at workplace	The trainee will be able to: <ol style="list-style-type: none"> 1. Assess the need for training 2. Prepare trainees for the learning experience 3. Present training session 4. Support trainees in managing their own learning 5. Facilitate group learning 6. Provide opportunity for practice 7. Provide feedback on progress on trainees 8. Review delivery experience 	<ul style="list-style-type: none"> • Explain the need for training • Importance of learning experience for trainees 	Total: 09hrs Theory: 03hrs Practical: 06hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Pen 	Class room

Module 3: Analyse with Workplace Policy and Procedures

Objective of the module: The aim of this module to get knowledge, skills and understanding to analyse with workplace policy and procedures

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Manage work timeframes	The trainee will be able to: <ol style="list-style-type: none"> 1. Complete work tasks within deadlines in according to order of priority 2. Supervisors are informed of any delays in work times or projects 	<ul style="list-style-type: none"> • Importance of time management strategies 	Total: 06hrs Theory: 02hrs Practical: 04hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class room
LU2: Manage to convene meeting	The trainee will be able to: <ol style="list-style-type: none"> 1. Develop agenda in line with meeting purpose 2. Select participants and notify them accordingly 3. Carryout meeting arrangements according to the time 	<ul style="list-style-type: none"> • Explain meeting terminologies • Importance of structures and arrangement of meeting 	Total: 06hrs Theory: 02hrs Practical: 04hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen <div>Non Consumable</div>	Class room

	4. Record the minutes of the meeting	<ul style="list-style-type: none"> Explain the organizational procedures and policies regarding meetings, chairing and minutes. 		<ul style="list-style-type: none"> White board Multimedia Internet Computer system 	
LU3: Set and meet own work priorities at instant	The trainee will be able to: <ol style="list-style-type: none"> Take initiative to prioritize and facilitate competing demands to achieve organizational goals and objectives Use technology efficiently and effectively to manage work priorities and commitments Maintain appropriate work-life balance 	<ul style="list-style-type: none"> Describe Healthy work life balance 	Total: 06hrs Theory: 02hrs Practical: 04hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpener Pen Non Consumable <ul style="list-style-type: none"> White board Multimedia Internet Computer system 	Class room
LU4: Develop and maintain professional competence	The trainee will be able to: <ol style="list-style-type: none"> Assess personal knowledge and skills against competency Participate in networks to enhance personal knowledge, skills and work relationships 	<ul style="list-style-type: none"> Explain the professional competence Importance of feedback 	Total: 06hrs Theory: 02hrs Practical: 04hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpener Pen Non Consumable	Class room

	3. Seek feedback from employees, clients and colleagues to develop and improve competence			<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	
LU5: Follow and implement work safety requirements	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify and report emergency incidents 2. Practice organizational policy and procedures for responding to emergency incidents 3. Identify and implement workplace procedures and work instructions for controlling risks 	<ul style="list-style-type: none"> • Explain the emergency incidents • Importance of organizational policy and procedures for emergency incidents 	Total: 06hrs Theory: 02hrs Practical: 04hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class room

Module 4: Maintain Electrical System of Equipment

Objective of the module: The aim of this module to get knowledge, skills and understanding to Maintain Electrical System of Equipment

Duration: 120 hours

Theory: 20 hours

Practical: 100 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Maintain Starting System	The trainee will be able to: <ol style="list-style-type: none"> 1. Check Battery and maintain Voltage according to standards 2. Maintain Current according to standards 3. Check and maintain Self Starting Motor using appropriate instruments and tools 4. Check and maintain pre-heater of engine 	<ul style="list-style-type: none"> • Introduction to Starting System • Maintenance tools and instruments and their usage (Multimeter) • Voltages • Importance of preventive maintenance checklist • Starting System of equipment (Sensors, solenoid, fuses, etc.) 	Total: 30hrs Theory: 05hrs Practical: 25hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • Distilled water 	Class Room/Workshop
		Practical Activity: <ol style="list-style-type: none"> 1. Check Battery and maintain Voltage according to standards. 2. Maintain Self Starting Motor using appropriate instruments and tools. 		Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Multimeter • Hydrometer 	

LU2: Maintain Charging System	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform health check of electrical cables 2. Maintain Battery Voltage according to standards 3. Check Battery Relays using appropriate instruments and tools 4. Maintain Battery Voltage using appropriate tool 5. Perform test bench of the alternator 6. Replace/repair alternator 	<ul style="list-style-type: none"> • Introduction to Charging System • Alternator • Bridge rectifier • Automatic Voltage Regulator (AVR) • Battery relay • Types of Fuse • Procedure to replace/repair alternator Practical Activity: <ol style="list-style-type: none"> 1. Check Battery Relays using appropriate instruments and tools and replace it as per requirement. 2. Perform test bench of the alternator and replace/repair it as per requirement. 	Total: 30hrs Theory: 05hrs Practical: 25hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • Distilled water Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Multimeter • Hydrometer • Alternator 	Class Room/Workshop
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LU3: Maintain Electrical Power System	The trainee will be able to: <ol style="list-style-type: none"> 1. Maintain operation of indicators, lights, etc. 2. Maintain working of wiping system 3. Maintain working of sensors 4. Replace faulty fuse 5. Maintain working of solenoid 	<ul style="list-style-type: none"> • Introduction to Electrical Power System • Wiring System • Sensors, solenoid and fuses • Types of indicators Practical Activity: <ol style="list-style-type: none"> 1. Check and maintain operation of indicators, lights and wiping system. 2. Inspect and replace faulty fuse. 	Total: 30hrs Theory: 05hrs Practical: 25hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • Distilled water Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Multimeter • Hydrometer • Alternator 	Class Room/Workshop
LU4: Maintain Wiring of Equipment	The trainee will be able to: <ol style="list-style-type: none"> 1. Interpret schematic wiring diagram from equipment manual 2. Check battery Resistance 	<ul style="list-style-type: none"> • Schematic wiring diagram • Maintenance tools and instruments and their usage (Multimeter) 	Total: 30hrs Theory: 05hrs Practical: 25hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners 	Class Room/Workshop

	<p>using appropriate instruments and tools</p> <p>3. Check and maintain continuity of wiring</p>	<ul style="list-style-type: none"> • Importance of preventive maintenance checklist • Starting System of equipment • Charging System of equipment • Lighting System of equipment • Wiring System • Sensors, solenoid and fuses 		<ul style="list-style-type: none"> • Pen • Cotton rags • Distilled water <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Multimeter • Hydrometer • Alternator 	
		<p>Practical Activity:</p> <ol style="list-style-type: none"> 1. Draw Schematic wiring diagram. 2. Check battery Resistance using appropriate instruments and tools. 			

Module 5: Maintain Mechanical System of Equipment

Objective of the module: The aim of this module to get knowledge, skills and understanding to Maintain Mechanical System of Equipment

Duration: 160 hours

Theory: 30 hours

Practical: 130 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Maintain Intake and exhaust System	The trainee will be able to: <ol style="list-style-type: none"> 1. Maintain Air Filters 2. Maintain Intake Manifold for any leakage 3. Maintain Tappet 4. Maintain Turbo Charger 5. Maintain Exhaust Gas Recirculation Valve (EGR) 6. Maintain Spark Arrestor 7. Measure Vacuum Pressure 8. Measure Compression 	<ul style="list-style-type: none"> • Define Intake and exhaust system • Turbo chargers • Exhaust Gas Recirculation (EGR) Valves • Inter cooler • Tappet • Air Filter • Inter Cooler and After Cooler 	Total: 37hrs Theory: 07hrs Practical: 30hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • Distilled water Non Consumable <ul style="list-style-type: none"> • White board 	Class Room/Workshop

	Pressure 9. Maintain Inter Cooler and After Cooler	Practical Activity: 1. Label Intake and exhaust System components of the engine. 2. Measure and record Vacuum and Compression Pressure.		<ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Vacuum Gauge • Compression Gauge • Excavator • Feeler Gauge 	
LU2: Maintain Cooling System	The trainee will be able to: 1. Replace faulty Engine Belts 2. Inspect and maintain Radiator 3. Inspect and maintain Hoses (Upper and lower) 4. Inspect and replace Thermostat Valve 5. Inspect and maintain condition of Ethylene Glycol in the cooling system using	<ul style="list-style-type: none"> • Define Cooling System • Engine Belts • Radiator • Hoses (Upper and lower) • Thermostat Valve • Properties of Ethylene Glycol • Water Pump • Cooling fan 	Total: 42hrs Theory: 07hrs Practical: 35hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • Distilled water Non Consumable <ul style="list-style-type: none"> • White board 	Class Room/Workshop

	Refractometer 6. Maintain Water Pump	Practical Activity: <ol style="list-style-type: none"> 1. Label Cooling System components of the engine. 2. Inspect and maintain radiator, thermostat valve and hoses of Cooling System of the engine. 3. Inspect and replace engine belts and water pump. 		<ul style="list-style-type: none"> • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Vacuum Gauge • Compression Gauge • Excavator 	
LU3: Maintain fuel System	The trainee will be able to: <ol style="list-style-type: none"> 1. Maintain Fuel Pump 2. Maintain Fuel Filter 3. Maintain Water Separator 4. Maintain Fuel Injector 	<ul style="list-style-type: none"> • Define Fuel System • Fuel Pump • Fuel Filter • Water Separator • Fuel Injector 	Total: 43hrs Theory: 08hrs Practical: 35hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags 	Class Room/Workshop

		Practical Activity: <ol style="list-style-type: none"> 1. Label Fuel System components of the engine. 2. Inspect and replace fuel filter. 		<ul style="list-style-type: none"> • Distilled water Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Excavator 	
LU4: Maintain Lubrication System	The trainee will be able to: <ol style="list-style-type: none"> 1. Change Lubricant oil and oil filter 2. Check leakage and take preventive measures 3. Maintain working of Lubrication Pump 4. Maintain working of Relief Valve 5. Maintain working of Sensors 	<ul style="list-style-type: none"> • Define Lubrication System • Oil Filter • Oil Pump • Relief valve • Oil Temperature • Pressure sensors • Oil leakages and preventive measures 	Total: 38hrs Theory: 08hrs Practical: 30hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Cotton rags • Distilled water Non Consumable	Class Room/Workshop

		Practical Activity: <ol style="list-style-type: none"> 1. Label Lubrication System components of the engine. 2. State reasons of possible leakages and their preventive measures. 3. Check and replace engine oil and filter. 		<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Maintenance Tool kit • Excavator 	
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Module 6: Maintain Hydraulic System of Equipment

Objective of the module: The aim of this module to get knowledge, skills and understanding to Maintain Hydraulic System of Equipment

Duration: 140 hours

Theory: 20 hours

Practical: 120 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Maintain Swing System	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform the maintenance of Hydraulic Tank 2. Perform the maintenance of Hydraulic Filter 3. Perform the maintenance of Hydraulic Pump 4. Perform the maintenance of Control Valves 5. Perform the maintenance of Hydraulic Motor 6. Perform the maintenance of Hydraulic Pipes 7. Change Swing machinery oil 	<ul style="list-style-type: none"> • Pascal Law • Explain Swing System of the hydraulic excavator • Procedure to maintain Swing System • Basic Properties of Hydraulic Oil • Hydraulic Circuit of Swing System <ul style="list-style-type: none"> ○ Hydraulic Tanks ○ Hydraulic pump ○ Pressure Control Valves ○ Direction Control Valves ○ Flow Control Valves ○ Hydraulic Motor 	Total: 35hrs Theory: 05hrs Practical: 30hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools/instruments • Wheeled Excavator • Crawler Excavator 	Class Room/Workshop

		<ul style="list-style-type: none"> Measuring instruments and their usage 		<ul style="list-style-type: none"> Excavator attachments Maintenance Tool kit 	
		Practical Activity: <ol style="list-style-type: none"> Label Swing System components of the excavator. Explain the Hydraulic Circuit of swing system. Change Swing machinery oil. 			
LU2: Maintain Work equipment system	The trainee will be able to: <ol style="list-style-type: none"> Perform the maintenance of Hydraulic Tank Perform the maintenance of Hydraulic Filter Perform the maintenance of Hydraulic Pump Perform the maintenance of Control Valves Perform the maintenance of Hydraulic Cylinders (Boom, bucket, arm, etc.) Perform the maintenance of 	<ul style="list-style-type: none"> Explain Work equipment System of the hydraulic excavator Procedure to maintain Work equipment System Hydraulic Circuit of Work equipment system <ul style="list-style-type: none"> Hydraulic Tanks Hydraulic pump Pressure Control Valves Direction Control Valves 	Total: 35hrs Theory: 05hrs Practical: 30hrs	Consumable <ul style="list-style-type: none"> Notebooks Pencils Erasers Sharpeners Pen Non Consumable <ul style="list-style-type: none"> White board Multimedia Internet Computer system Measuring tools 	Class Room/Workshop

	Hydraulic Pipes	<ul style="list-style-type: none"> ○ Flow Control Valves ○ Hydraulic Cylinders • TVC (Torque Variable Control) Valve • CO (Cut Off) Valve • NC (Negative Control) Valve • Servo Valve • Servo Piston 		<ul style="list-style-type: none"> • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit • Multimeter • Thermistor kit • Hydraulic pressure gauge 	
		Practical Activity: <ol style="list-style-type: none"> 1. Label Work equipment System components of the excavator. 2. Perform the maintenance of Hydraulic Pump. 3. Perform the maintenance of Control Valves. 4. Perform the maintenance of Hydraulic Cylinders (Boom, bucket, arm, etc.) 			

LU3: Maintain Travel System	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform the maintenance of Hydraulic Tank 2. Perform the maintenance of Hydraulic Filter 3. Perform the maintenance of Hydraulic Pump 4. Perform the maintenance of Control Valves 5. Perform the maintenance of Hydraulic Travel Motors 6. Perform the maintenance of Hydraulic Pipes 7. Change Final drive oil 	<ul style="list-style-type: none"> • Explain Travel System of the hydraulic excavator • Procedure to maintain Travel System • Hydraulic Circuit of Travel system <ul style="list-style-type: none"> ○ Hydraulic Tanks ○ Hydraulic pump ○ Pressure Control Valves ○ Direction Control Valves ○ Flow Control Valves ○ Hydraulic Motor ○ Brake system ○ Final drive 	Total: 35hrs Theory: 05hrs Practical: 30hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator 	Class Room/Workshop
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		Activity: <ol style="list-style-type: none"> 1. Label Travel System components of the excavator. 2. Perform the maintenance of Control Valves. 3. Perform the maintenance of Hydraulic Travel Motors. 4. Change Final drive oil. 		<ul style="list-style-type: none"> • Excavator attachments • Maintenance Tool kit • Air pressure Gauge • Hydraulic Pressure Gauges • Multimeter • Thermistor kit 	
LU4: Maintain Open Load Sensing System (OLSS)	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform the maintenance of TVC Valve 2. Perform the maintenance of CO Valve 3. Perform the maintenance of NC Valve 4. Perform the maintenance of Servo Valve 5. Perform the maintenance of Servo Piston 	<ul style="list-style-type: none"> • Explain Open Load Sensing System (OLSS) of the hydraulic excavator • Procedure to maintain Open Load Sensing System (OLSS) System • Hydraulic Open Load Sensing System (OLSS): <ul style="list-style-type: none"> ○ TVC (Torque Variable Control) Valve ○ CO (Cut Off) Valve 	Total: 35hrs Theory: 05hrs Practical: 30hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system 	Class Room/Workshop

		<ul style="list-style-type: none"> ○ NC (Negative Control) Valve ○ Servo Valve ○ Servo Piston 		<ul style="list-style-type: none"> • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit • Hydraulic Pressure Gauges • Multimeter • Thermistor kit 	
		<p>Practical Activity:</p> <ol style="list-style-type: none"> 1. Label Open Load Sensing System (OLSS) components of the excavator. 2. Perform the maintenance of TVC Valve, CO Valve and NC Valve. 3. Perform the maintenance of Servo Valve and Servo Piston. 			

Module 7: Develop a Preliminary Project Plan

Objective of the module: The aim of this module to get knowledge, skills and understanding to develop a Preliminary Project Plan.

Duration: 250 hours

Theory: 40 hours

Practical: 210 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform Survey of Area	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform reconnaissance survey of area for project 2. Perform topographic survey of area for project 3. Prepare map of area for project 	<ul style="list-style-type: none"> • Types of Survey • Types of Maps • Importance of preliminary planning 	Total: 64hrs Theory: 10hrs Practical: 54hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • PPEs <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet 	Class Room/Workshop

		Practical Activity: 1. Perform topographic survey and prepare map of the assigned area.		<ul style="list-style-type: none"> • Computer system • Measuring tools/Devise • Auto Level • Theodolite • Ranging Rod • EDM & Prism • Staff • Wooden Peg • Compass 	
LU2: Prepare Estimate	The trainee will be able to: 1. Prepare rough cost and detail estimation 2. Estimate the quantity 3. Estimate the unit cost 4. Calculate the total cost 5. Mark options on the prepared map 6. Get Administrative approval of cost and estimation	<ul style="list-style-type: none"> • Methods of estimation (Centerline method, long wall, short wall method, etc.) • Types of estimation (Rough and detailed estimation) • Bill of Quantity (BOQ) • Rate analysis (MRS, CSR and Non-MRS) 	Total: 62hrs Theory: 10hrs Practical: 52hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Measurement Book • PPEs Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet 	Class Room/Workshop

				<ul style="list-style-type: none"> • Computer system • Calculator 	
LU3: Prepare the plan of project features	The trainee will be able to: <ol style="list-style-type: none"> 1. Prepare the project plan as per requirement 2. Perform Survey as per the requirement 3. Prepare working drawings of project 	<ul style="list-style-type: none"> • Types of Planning • Survey execution • Working Drawings 	Total: 62hrs Theory: 10hrs Practical: 52hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Drawing sheets • Drawing pencils • PPEs Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Calculator • Drawing Board 	Class Room/Workshop
LU4: Prepare feasibility report	The trainee will be able to: <ol style="list-style-type: none"> 1. Identify construction and system feasibility- resources 	<ul style="list-style-type: none"> • Pre-feasibility study • Types of feasibility study 	Total: 62hrs Theory: 10hrs Practical: 52hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils 	Class Room/Workshop

	<p>for project</p> <ol style="list-style-type: none"> 2. Identify social benefits from the project-operations 3. Estimate quantity of work, time, and available resources for project 4. Prepare feasibility report of project 	<ul style="list-style-type: none"> • Steps involved in feasibility study • Difference between feasibility report and project report • Data to be collected and aspects to be considered in feasibility report • Aspects to be considered during preparation of project report 		<ul style="list-style-type: none"> • Erasers • Sharpeners • Pen • Measurement Book • PPEs <p>Non Consumable</p> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Calculator 	
		<p>Practical Activity:</p> <ol style="list-style-type: none"> 1. Prepare feasibility report of assigned project like: 1000 sft. Single storey building. 			

Module 8: Perform Advance Digging/Excavation Operations

Objective of the module: The aim of this module to get knowledge, skills and understanding to perform Advance Digging/Excavation Operations.

Duration: 320 hours

Theory: 50 hours

Practical: 270 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare Trenches	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform preparatory activities 2. Fit appropriate attachment to the equipment according to the job requirement 3. Set the work equipment according to the job requirement 4. Perform excavation to prepare Trench as per requirement 5. Monitor equipment performance 	<ul style="list-style-type: none"> • Technical drawings • Classification of excavation • Different types of attachment used on excavator • Benchmarking • Sequence of operations to achieve the job requirements • PPE's 	Total: 90hrs Theory: 15hrs Practical: 75hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Plaster of Paris (Powder) <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet 	Class Room/Worksite

	<ol style="list-style-type: none"> 6. Coordinate activities with site team 7. Perform post digging/Excavation activities 8. Submit the job completion report to the concern person 	Practical Activity: <ol style="list-style-type: none"> 1. Prepare Layout at the site as per technical drawing. 2. Prepare a Trench according to the given drawing/Layout 3. Prepare the job completion report 		<ul style="list-style-type: none"> • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit 	
LU2: Perform Geometrical Shapes Excavation	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform preparatory activities 2. Fit appropriate attachment to the equipment according to the job requirement 3. Set the work equipment according to the job requirement 	<ul style="list-style-type: none"> • Excavation in Geometrical Shapes • Selection of equipment according to the job requirement • Importance of coordinating with site team 	Total: 90hrs Theory: 15hrs Practical: 75hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Plaster of Paris (Powder) Non Consumable	Class Room/Worksite

	<ol style="list-style-type: none"> 4. Perform excavation to prepare Geometrical shapes as per requirement 5. Monitor equipment performance 6. Coordinate activities with site team 7. Perform post digging/ Excavation activities 8. Submit the job completion report to the concern person 	Practical Activity: <ol style="list-style-type: none"> 1. Prepare Layout on the site as per technical drawing. 2. Prepare a machine by fixing attachments as per job requirement 3. Perform excavation to prepare Geometrical shapes according to the given drawing/Layout 		<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments • Maintenance Tool kit 	
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LU3: Perform different types of excavations	The trainee will be able to: <ol style="list-style-type: none"> 1. Perform preparatory activities 2. Fit appropriate attachment to the equipment according to the job requirement 3. Set the work equipment according to the job requirement 4. Perform Cut & Fill (Stripping) excavation 5. Perform Barrow excavation 6. Perform Channel excavation 7. Perform Top Soil excavation 8. Perform Bridge excavation 9. Perform Drainage excavation 10. Perform Rock excavation 11. Perform Muck excavation 12. Perform post digging/ Excavation activities 13. Coordinate activities with site team 14. Perform post digging/ 	<ul style="list-style-type: none"> • Procedures to perform different types of excavations: <ul style="list-style-type: none"> ◦ Cut & Fill (Stripping) excavation ◦ Barrow excavation ◦ Perform Channel excavation ◦ Perform Top Soil excavation ◦ Perform Bridge excavation ◦ Perform Drainage excavation ◦ Perform Rock excavation ◦ Perform Muck excavation • Selection of equipment according to the job requirement 	Total: 140hrs Theory: 20hrs Practical: 120hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • Pen • Plaster of Paris (Powder) <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Measuring tools • Wheeled Excavator • Crawler Excavator • Excavator attachments 	Class Room/Worksite
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	<p>Excavation activities</p> <p>15. Submit the job completion report to the concern person</p>	<p>Practical Activity:</p> <ol style="list-style-type: none"> 1. Prepare Layout on the site as per technical drawing. 2. Execute Cut & Fill (Stripping) excavation according to the assigned drawing/Layout. 3. Execute Drainage excavation according to the assigned drawing/Layout. 		<ul style="list-style-type: none"> • Maintenance Tool kit 	
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Module 11: Perform 2D and 3D Engineering Drawings using CAD Software

Objective of the module: The aim of this module to get knowledge, skills and understanding to Perform 2D and 3D Engineering Drawings using CAD Software.

Duration: 120 hours

Theory: 20 hours

Practical: 100 hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Draw 2D shapes	The trainee will be able to: <ol style="list-style-type: none"> 1. Setup user interface settings for required drawing. 2. Create different 2D shapes with given measurements. 3. Edit different 2D shapes to meet requirement. 4. Insert dimensions and symbols as per requirement 5. Save the file in different drawing formats 	<ul style="list-style-type: none"> • Explain import export of drawing sketch in different formats in CAD Software • Explain 2D setup • Functions of Creating and Editing tools • Dimensions and Symbols • Different file extensions for saving files (JPEG, PDF, etc.) 	Total: 24hrs Theory: 04hrs Practical: 20hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • USB 	Computer Lab
		Practical Activity: <ol style="list-style-type: none"> 1. Draw and practice a layout of a computer lab. 		Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Printer 	

LU2: Prepare final sets of 2D drawings	The trainee will be able to: <ol style="list-style-type: none"> 1. Develop 2D Drawing with given project specification and measurements. 2. Plot drawing on scale according to required size & orientation. 	<ul style="list-style-type: none"> • Knowledge of scale and unit • Procedure to prepare 2D drawing according to given scale <p>Practical Activity:</p> <ol style="list-style-type: none"> 1. Draw and practice a layout of 5 Marla single storey house. 	Total: 24hrs Theory: 04hrs Practical: 20hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • USB • Printing Sheets <div>Non Consumable</div> <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Printer • Plotter 	Computer Lab
LU3: Develop 3D Objects	The trainee will be able to: <ol style="list-style-type: none"> 1. Setup 3D user interface settings for required drawing. 2. Create different 3D objects with given measurements. 	<ul style="list-style-type: none"> • 3D modelling in AutoCAD <ul style="list-style-type: none"> ○ 3D solids ○ surfaces ○ meshes ○ Wireframe objects ○ Difference between Surface Modelling and Solid Modelling 	Total: 24hrs Theory: 04hrs Practical: 20hrs	<div>Consumable</div> <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • USB • Printing Sheets <div>Non Consumable</div>	Computer Lab

		Practical Activity: <ol style="list-style-type: none"> 1. Draw and practice 3D views of different Beams using Auto CAD. 		<ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Printer • Plotter 	
LU4: Manipulate 3D objects using 3D Editing Tools	The trainee will be able to: <ol style="list-style-type: none"> 1. Modify 3D objects in line with the requirements. 2. Make customised 3D models according to the requirement of given job. 3. Generate orthographic views from 3D model 4. Generate sectional/auxiliary views from 3D model as per requirement 	<ul style="list-style-type: none"> • Boolean operation on 3D solid model <ul style="list-style-type: none"> ◦ Subtraction ◦ Intersection ◦ Union • 3D Navigate control <ul style="list-style-type: none"> ◦ Pre-set views such as isometric, top, bottom, front, left, etc. ◦ Perspective projection and parallel projection ◦ Constrained Orbit • Insertion of Standard parts from CAD library 	Total: 24hrs Theory: 04hrs Practical: 20hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • USB • Printing Sheets Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Printer • Plotter 	Computer Lab

		Practical Activity: 1. Import and extrude any 2D drawing into 3D view.			
LU5: Render 3D Model	The trainee will be able to: 1. Apply material to required 3D Model as per given specification 2. Render and print the 3D model according to required size & orientation. 3. Apply material texture to 3D model as per requirement.	<ul style="list-style-type: none"> • Rendering tools and commands • Material and light control • Procedure to apply material textures 	Total: 24hrs Theory: 04hrs Practical: 20hrs	Consumable <ul style="list-style-type: none"> • Notebooks • Pencils • Erasers • Sharpeners • USB • Printing Sheets Non Consumable <ul style="list-style-type: none"> • White board • Multimedia • Internet • Computer system • Printer • Plotter 	Computer Lab

General Assessment Guidance for Assistant Operational 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 Digging Operation Supervisor include:

- Work performances, for example perform basic communication, maintain personal health, hygiene and safety and perform basic computer operations
- Demonstrations, for example Identifying Electrical Circuits and Measurements
- Direct questioning, where the assessor would ask the student how to perform personal safety at work place, how they can communicate work place policy and procedures, how they can create electrical circuits and how they can measure these circuits

- Paper-based tests, such as multiple choice or short answer questions on communication at work place policy and procedures, Electrical Circuits and Measurements
- Indirect assessment is the method used where the performance could not be watched and evidence is gained indirectly.

Examples for indirect assessment of a Digging Operation Supervisor include:

- Work products, such as preparing and handling documents, perform some procedures of Milling

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 documentation or identifying Electrical Circuits and Measurements are to be assessed and certificated, the assessment should involve performance criteria that are directly related to that documentation activity. An interview about the identifying Electrical Circuits and Measurements 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 Assistant *Digging Operation/Technology*

This curriculum consists of 9 modules:

- **Module 1:** Establish and maintain the occupational Health and safety system
- **Module 2:** Perform Advance communication
- **Module 3:** Analyse Workplace Policies and Procedures
- **Module 4:** Maintain Electrical System of Equipment
- **Module 5:** Maintain Mechanical System of Equipment
- **Module 6:** Maintain Hydraulic System of Equipment
- **Module 7:** Develop Preliminary Project Plan
- **Module 8:** Perform Advance Digging/Excavation Operations
- **Module 9:** Perform 2D – 3D Engineering Drawings using CAD Software

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.	Crawler Excavator	5
34.	Wheel Excavator	5
35.	Wrenches	5
36.	Pliers	5
37.	Screw driver (Positive and negative)	5
38.	Hammer	5

39.	Vice grip	5
40.	Grease gun	5 each
41.	Paint brush	10
42.	Steel brush	25
43.	Crawler Excavator	10
44.	Measuring tape	10
45.	High pressure washer	5
46.	Air compressor	5
47.	Rigid and articulated dump truck (Off road)	5
48.	Dump truck (On road)	10 set
49.	Hopper	10
50.	Conveyor	10
51.	Vernier caliper (out, inside)	5
52.	Torque gauge	5
53.	Steel rule	5
54.	Multi-meter	5
55.	Thermometers	5
56.	Spanner set	10 packs
57.	Socket set	1
58.	ST(special service Tool)	1
59.	Drilling Machines	1

60.	Location Determining Devices	1
61.	Digging slant determining devices	1
62.	Communication Devices	10
63.	Sample Boxes	10
64.	Exploration and Scanning Devices	2
65.	Drawing board	25

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.	Clutch pencils	25
8.	Sticky Notes	25
9.	Card sheets	100
10.	Cleaning brush	25
11.	Cotton rags	1KG

12.	PPE's	25
13.	Lubricants	In Litters
14.	Drawing Board	25
15.	Drawing Sheets	25 Books

Credit Values

The credit value of the National Certificate Level 2 in Dies & Digging Operation 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:

Competency Standard	Estimate of hours	Credit
A. Establish and maintain the occupational Health and safety system	30	3
B. Perform Advance communication	30	3
C. Analyse Workplace Policies and Procedures	30	3
D. Maintain Electrical System of Equipment	120	12
E. Maintain Mechanical System of Equipment	160	16
F. Maintain Hydraulic System of Equipment	140	14
G. Develop Preliminary Project Plan	250	25
H. Perform Advance Digging/Excavation Operations	320	32
I. Perform 2D – 3D Engineering Drawings using CAD Software	120	12