

# HEAT VENTILATION & AIR CONDITIONING (HVAC)

## Trainer Guide

National Vocational  
Certificate Level 2

Version 1 - March 2014

**Published by**

National Vocational and Technical Training Commission  
Government of Pakistan

**Headquarter**

Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan  
www.navttc.org

**Responsible**

Director General Skills Standard and Curricula, National Vocational and Technical Training Commission  
National Deputy Head, TVET Reform Support Programme, Deutsche Gesellschaft für Internationale  
Zusammenarbeit (GIZ) GmbH

**Layout & design**

SAP Communications

**Photo Credits**

TVET Reform Support Programme

**URL links**

Responsibility for the content of external websites linked in this publication always lies with their respective publishers. TVET Reform Support Programme expressly dissociates itself from such content.

This document has been produced with the technical assistance of the TVET Reform Support Programme, which is funded by the European Union, the Embassy of the Kingdom of the Netherlands, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs)s and private sector organizations.

**Document Version**

July, 2015

**Islamabad, Pakistan**

# HEAT VENTILATION & AIR CONDITIONING (HVAC)

**Trainer Guide**

National Vocational  
Certificate Level 2

Version 1 - March 2014

## Contents

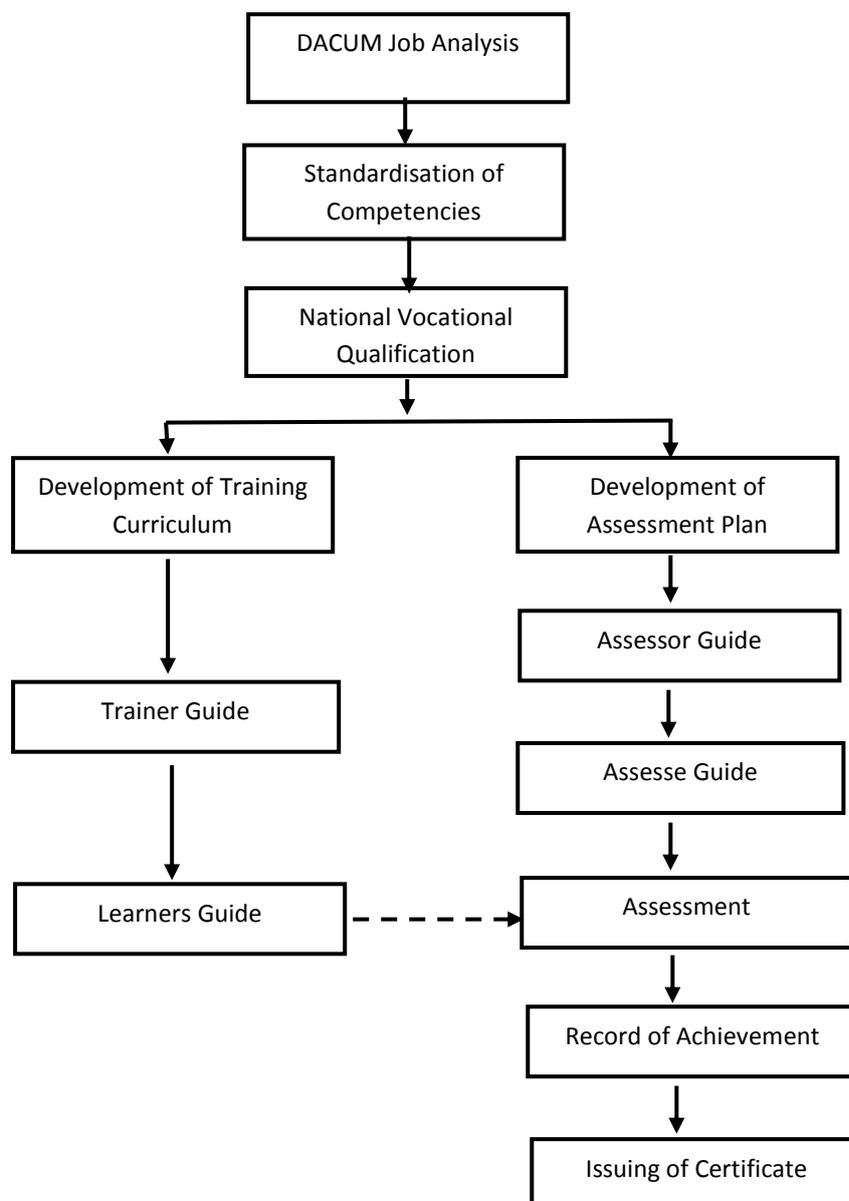
INTRODUCTION.....	3
EVALUATION OF TRAINING MATERIAL .....	5
GUIDELINES FOR WRITING LESSON PLAN.....	6
LESSON PLANS .....	7
LESSON PLAN - 1 .....	8
LESSON PLAN - 2.....	10
LESSON PLAN - 3.....	12
LESSON PLAN - 4.....	14
LESSON PLAN - 5.....	15
LESSON PLAN - 6.....	17
LESSON PLAN - 7.....	18
LESSON PLAN - 8.....	19
DEMONSTRATION OF SKILL.....	20
OVERVIEW OF PROGRAMME.....	21
TRAINER GUIDELINES.....	24
Module 01: Initiate HVAC Work.....	24
Module 02: Install HVAC Units.....	28
Module 03: Remove existing HVAC unit.....	35
Module 04: Test HVACs Unit Performance.....	39
Module 05: Conduct Preventive Maintenance on HVAC Equipment.....	43
Module 06: Repair Refrigeration Cycle.....	46
Module 07: Develop Professionalism .....	50

# INTRODUCTION

This Guide supports the Competency-Based Training Curricula that will enable the trainees to achieve the competency standards that have been set by the relevant industry group.

The NVQF Competency-Based Training Curricula along with the associated Training Guides and the Assessment Guides are all developed from the skill competency standards established by the Industry Advisory Group (IAG).

Figure 1 outlines the process of developing the competencies, developing the curriculum and the assessment requirements, and delivering the training program and the assessments necessary to certify achievement of the competencies.



The Trainer Guide provides guidelines and instructions to Trainers on the approaches that are required and on the organisation and delivery of the curriculum training program.

### *Curriculum*

The Curriculum Manual is included in the Training and Learning Materials Package.

The curriculum is organised as a series of modules. Each module is broken down into a series of Learning Units. Each Learning Unit includes Learning Outcomes, Learning Elements, an estimate of the time needed, a list of materials required and the location for the learning to take place.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials needed	Location

### *Lesson Plans*

The Trainer will need to develop a coherent set of lesson plans for each module of the curriculum. This Guide includes a Lesson Plan Template. The Lesson Plans must be filed for later review if necessary.

### *Assessment*

It is necessary to assess the knowledge and skills of the trainees at the completion of each module.

(See the Assessment Guide for further details)

### *Evaluation of Training Material*

Trainers are invited to evaluate the Training Materials based on their experience of delivering the training. A template is provided to assist.

## EVALUATION OF TRAINING MATERIAL

*The trainers/instructors who implement this training material can inform NAVTTC promptly of any shortcomings in training material on the following format. Please consider it as one of your responsibilities.*

Format

<b>Trade:</b>			
<b>Training Material</b>	<b>Module Title &amp; Module Code</b>	<b>Learning Unit Title &amp; Learning Unit Code</b>	<b>Suggested amendments/ feedback/proposal</b>
Trainer Guide			
Learner Guide			
<b>Trainer Name:</b>		<b>Training Centre:</b>	
<b>Signature of Trainer:</b>		<b>Date:</b>	

## GUIDELINES FOR WRITING LESSON PLAN

The template for lesson plan has been provided at next page. These guidelines are for trainers for writing their own lesson plans which are as follows:

1. Introduce yourself and the Learning Unit, and state the Learning Outcomes of the session clearly to activate attention of learners.
2. In **Introduction** part of lesson plan state the Learning Objectives of the lesson. This allows the learners to organize their thoughts on what they will learn and to perform. Also state some questions to recall prior knowledge of learners to arouse their interest and motivation.
3. In **Body** part of lesson plan present the new information or material that is to be learned. Demonstration of a skill relevant with the Learning Unit is also stated here. Also mention the teaching and learning methods for each learning element from *Trainer Guidelines*, the relevant media including handouts, power-point slides, videos, white board and time duration for each activity in the relevant columns.
4. In **Conclusion** part list the strategies used for summarizing and reviewing the lesson delivered. Also mention the strategies for formative assessment to ensure that the transfer of knowledge and skill has been achieved.

## LESSON PLANS

*Dear Instructors,*

*Model Lesson Plans for one module have been provided in this trainer guide. A format and guidelines for writing Lesson Plans have also been provided in the succeeding pages. You are advised to prepare your own lesson plans for the remaining Learning Units using the suggested format and guidelines.*

## LESSON PLAN - 1

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 01</b>	Follow Dress Code		
<b>Learning Outcomes:</b>			
After completion of this module the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Wear Personal Protective Equipment (PPE) before initiating work.</li> <li>• Gentle haircut or covered properly for safely work.</li> <li>• Cut nail and maintain personal hygiene.</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners.  State the following learning objectives: <ul style="list-style-type: none"> <li>• Describe importance of Personal Protective Equipment (PPE) before initiating work</li> <li>• Demonstrate how to use Personal Protective Equipment.</li> <li>• State the importance of physical appearance for safety and to avoid industrial hazard.</li> </ul>	Multi-media Projector White Board Charts	15 min
<b>Main Body</b>			
<i>LECTURE</i>  -DO-  -do-  <i>Illustrative Talk</i>	<ul style="list-style-type: none"> <li>• Explain the importance of Personal safety measures</li> <li>• Explain work place safety measures</li> <li>• Describe how to Utilize PPE:               <ul style="list-style-type: none"> <li>• PPE includes: Fire Extinguisher, Safety Helmet, Safety Shoes, Goggles and Dungarees etc.</li> </ul> </li> <li>• Describe workplace safety according to standard procedures of trade</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visuals</li> <li>• First aid box</li> </ul>	50 min
<b>Conclusion</b>			

Feedback  FAQs.	Summarize the lesson by reviewing the important points.  Asses the learning by asking some questions.		15 min
<b>Total time:</b>			80 min

## LESSON PLAN - 2

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 02</b>	Clean up service vehicle		
<b>Learning Outcomes:</b>			
After completion of this Learning Unit the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Check vehicle fuel to attain job site</li> <li>• Check breaking system accordingly</li> <li>• Check cooling system of vehicle to maintain vehicle performance</li> <li>• Inspect electrical system of vehicle accordingly</li> <li>• Check vehicle functions</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners. State the following learning objectives: <ul style="list-style-type: none"> <li>• Check vehicle fuel to attain job site</li> <li>• Check breaking system accordingly</li> <li>• Check cooling system of vehicle to maintain vehicle performance</li> <li>• Inspect electrical system of vehicle accordingly</li> <li>• Check vehicle functions</li> </ul>	Multi-media Projector White Board	10 min
<b>Main Body</b>			
<i>LECTURE</i>  -DO-  -do-  -do-  -do-	<ul style="list-style-type: none"> <li>• Describe light vehicle rule and regulations according to standards</li> <li>• Appraise about Physical Fitness of Vehicle</li> <li>• Explain travel route of jobsite</li> <li>• Explain importance of water level in radiator and Battery</li> <li>• State basic electrical maintenance of vehicle</li> <li>• State basic mechanical maintenance</li> <li>• Explain positive attitude during drive</li> <li>• Ensure fire extinguisher must be in working</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visuals</li> </ul>	50 min

	condition		
<b>Conclusion</b>			
Feedback	Summarize by reviewing the important points.		15 min
FAQs.	Asses the learning by asking some questions and answers.		
<b>Total time:</b>			<b>75 min</b>

## LESSON PLAN - 3

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 03</b>	Clean-up Job site		
<b>Learning Outcomes:</b>			
After completion of this Learning unit the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Clean slippery material from workplace &amp; surrounding for smooth operation</li> <li>• Remove extra material from workplace to reduce uncertainty</li> <li>• Prepare platform for clean and safe job done</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners.  State the following learning objectives: <ul style="list-style-type: none"> <li>• Clean slippery material from workplace &amp; surrounding for smooth operation</li> <li>• Remove extra material from workplace to reduce uncertainty</li> <li>• Prepare platform for clean and safe job done</li> <li>• Use of scaffolding</li> </ul>	Multi-media Projector White Board Charts	10 min
<b>Main Body</b>			
<i>Lecture</i>  <i>-do-</i>  <i>-do-</i>	<ul style="list-style-type: none"> <li>• Describe good housekeeping practices according to organization standards</li> <li>• State the importance of clear light and proper ventilation</li> <li>• Describe work ethics</li> <li>• Explain Toxic material hazards and prevention at job site</li> <li>• State the method of disposing-off extra material(garbage, etc)</li> <li>• Explain 5S (sort, straighten, shine, standardize, and sustain).</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visuals</li> <li>• Charts</li> </ul>	35 min
<b>Conclusion</b>			

Feedback	Summarize by reviewing the important points.		15 min
FAQs.	Asses the learning by asking some questions and answers.		
<b>Total time:</b>			60 min

## LESSON PLAN - 4

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 04</b>	Perform Maintenance on Tools (Maintain Tools)		
<b>Learning Outcomes:</b>			
After completion of this Learning unit the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Clean tools as described</li> <li>• Service the tools if required for relevant working condition</li> <li>• Place tools properly for safe and correct operations</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners.  State the following learning objectives: <ul style="list-style-type: none"> <li>• Clean tools as described</li> <li>• Service the tools if required for proper working condition</li> <li>• Place tools properly for safe and correct operations</li> </ul>	Multi-media Projector  White Board  Charts	10 min
<b>Main Body</b>			
<i>Lecture</i>  -do-  -do-	<ul style="list-style-type: none"> <li>• Identification of Tools and Equipment</li> <li>• Describe functions of Tools and Equipment</li> <li>• Describe use of Tools and Equipment</li> <li>• Maintenance of Tools and Equipment according to Standards</li> <li>• Describe method of storing Tools and Equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visuals</li> <li>• Multi-media</li> </ul>	50 min
<b>Conclusion</b>			
Feedback	Summarize by reviewing the important points.		15 min
FAQs.	Assess the learning by asking some questions.		
<b>Total time:</b>			<b>75 min</b>

## LESSON PLAN - 5

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 05</b>	Perform Maintenance on Test Equipment (Maintain Test Equipment)		
<b>Learning Outcomes:</b>			
After completion of this Learning Unit the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Clean test equipment for correct operation accordingly</li> <li>• Service the equipment if required for accurate operation</li> <li>• Place equipment properly</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners.  State the following learning objectives: <ul style="list-style-type: none"> <li>• Clean test equipment for correct operation accordingly</li> <li>• Service the equipment if required for accurate operation</li> <li>• Place equipment properly</li> </ul>	Multi-media Projector White Board Charts	10 min
<b>Main Body</b>			
<i>Lecture</i>  -do-  -do-  -do-  -do-	<ul style="list-style-type: none"> <li>• Identification of test equipment</li> <li>• Describe functions and use of test equipment</li> <li>• Explain basic Electrical Terms (Voltage, Current, Resistance, Power)</li> <li>• Explain basic Mechanics(Vibration, Noise, Humidity, Air Pressure, Atmospheric Pressure)</li> <li>• Describe Boil's law</li> <li>• Describe Charles's Law</li> <li>• Explain Refrigerant and properties of best/common Refrigerants.</li> <li>• Explain effect of pressure on Boiling point &amp; on Temperature</li> <li>• Explain basic refrigeration cycle</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visuals</li> <li>• Multi-media</li> </ul>	90 min

-do-	<ul style="list-style-type: none"> <li>• Explain Air Conditioning</li> <li>• Explain Conditioned Space</li> <li>• Explain Psychometric Chart (Dry bulb Temperature, Wet bulb, Relative Humidity, Dew point Temperature, Enthalpy).</li> <li>• Explain use of test equipment</li> <li>• Maintenance of test equipment as described</li> <li>• Store test equipment as described standards</li> </ul>		
<b>Conclusion</b>			
Feedback	Summarize by reviewing the important points.		15 min
FAQs.	Asses the learning by asking some questions and answers.		
<b>Total time:</b>			<b>115 min</b>

## LESSON PLAN - 6

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 06</b>	Report safety violations		
<b>Learning Outcomes:</b>			
After completion of this Learning Unit the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Collect evidence of safety violations</li> <li>• Check Electrical Hazards</li> <li>• Check Mechanical Hazards</li> <li>• Report safety violation to concerned if any</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners.  State the following learning objectives: <ul style="list-style-type: none"> <li>• Collect evidence of safety violations</li> <li>• Check electrical hazards</li> <li>• Check mechanical risks</li> <li>• Report safety violation to concerned if any</li> </ul>	Multi-media Projector White Board Charts	10 min
<b>Main Body</b>			
<i>Lecture</i>  -do-  -do-  -do-	<ul style="list-style-type: none"> <li>• State the safety rules and regulations of HVACR workshop</li> <li>• Describe Electric Short Circuit and possible reasons of Short Circuit</li> <li>• Explain and classify basic Firefighting equipment their usage and applications</li> <li>• Describe Hazards material(Electrical, Mechanical And Chemical In HVACs Filed)</li> <li>• Describe emergency procedure of workshop</li> <li>• Fill the job cards and procedure of safety reporting</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visuals</li> <li>• Multi-media</li> </ul>	50 min
<b>Conclusion</b>			
Feedback	Summarize by reviewing the important points.		15 min
FAQs.	Asses the learning by asking some questions and answers.		
<b>Total time:</b>			75 min

## LESSON PLAN - 7

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 07</b>	Delegate work to subordinate		
<b>Learning Outcomes:</b>			
After completion of this Learning Unit the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Sequence the job</li> <li>• Split the job</li> <li>• Check the work done by subordinates</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners.  State the following learning objectives: <ul style="list-style-type: none"> <li>• Sequence the job</li> <li>• Split the job</li> <li>• Check the work done by subordinates</li> </ul>	Multi-media Projector  White Board	10 min
<b>Main Body</b>			
<i>Lecture</i>  -do-  <i>Lecture</i>	<ul style="list-style-type: none"> <li>• Plan job requirement in context with available human resources</li> <li>• Delegate job responsibilities to the subordinate as per requirement of job and their capacities.</li> <li>• Job distribution according to plan described</li> <li>• Check Quality of job.</li> <li>• Assure quality assurance of workers performance</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visuals</li> <li>• Multi-media</li> </ul>	40 min
<b>Conclusion</b>			
Feedback	Summarize by reviewing the important points.		15 min
FAQs.	Asses the learning by asking some questions and answers.		
<b>Total time:</b>			65 min

## LESSON PLAN - 8

<b>Module 01</b>	Initiate HVAC Work		
<b>Learning Unit 08</b>	Obtain material from Store		
<b>Learning Outcomes:</b>			
After completion of this Learning Unit the Learner should be able to:			
<ul style="list-style-type: none"> <li>• Make list of required materials according to job.</li> <li>• Verify the material as per standards</li> </ul>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<i>Lecture</i>	Introduce the learning unit to learners.  State the following learning objectives: <ul style="list-style-type: none"> <li>• Make list of required materials according to job.</li> <li>• Verify the material as per requirement and standards</li> </ul>	Multi-media Projector  White Board  Charts	10 min
<b>Main Body</b>			
<i>Lecture</i>  -do-  <i>Lecture</i>	<ul style="list-style-type: none"> <li>• Describe material as required for job</li> <li>• Explain quality and quantity of material</li> <li>• Describe method for preparation of Store requisition</li> <li>• Explain the method of checking material as per standards of HVACR field</li> </ul>	<ul style="list-style-type: none"> <li>• White Board</li> <li>• Visual</li> <li>• Multi-media</li> </ul>	30 min
<b>Conclusion</b>			
Feedback	Summarize by reviewing the important points.		15 min
FAQs.	Asses the learning by asking some questions and answers.		
<b>Total time:</b>			55 min

## DEMONSTRATION OF SKILL

Demonstration or modelling a skill is a powerful tool which is used in vocational training. The instructions for trainers for demonstration are as under:

1. Read the Procedure mentioned in the Learner Guide for the relevant Learning Unit before demonstration.
2. Arrange all tools, equipment and consumable material which are required for demonstration of a skill.
3. Practice the skill before demonstration to learners, if possible.
4. Introduce the skill to learners clearly at the commencement of demonstration.
5. Explain how the skill relates with the skill(s) already acquired and describe the expected results or show the objects to learners.
6. Carry out demonstration in a way that it can be seen by all learners.
7. Perform each step slowly and read out each step of the Performance Guide loudly so that all learners can hear and understand.
8. Identify critical or complex steps, or steps that involve safety precautions to be followed.
9. Explain theoretical knowledge where applicable and ask questions to learners to test their understanding.
10. Repeat critical steps in demonstration, if required.
11. Summarize the demonstration by asking questions to learners.

## OVERVIEW OF PROGRAMME

### Course: Heating Ventilation and Air-conditioning

#### Course Overview:

This course enables the trainees to perform routine skilled and semi-skilled tasks to carry out a variety of HVAC install and troubleshoot & maintenance jobs and assist other team members in assigned preventive maintenance, installations, and repairs of HVAC equipment, facilities and systems.

Module	Learning Unit	Duration
1: Initiate HVAC work	LU1: Follow dress code LU2: Clean up service vehicle LU3: Clean up Job site LU4: Perform maintenance on tools (maintain tools) LU5: Perform maintenance on test equipment (maintain test equipment) LU6: Report safety violations LU7: Delegate work to subordinate LU8: Obtain material from Store	40 hours
2: Install HVAC Unit	LU1: Identify job specifications LU2: Verify field locations and measurements LU3: Obtain specified equipment LU4: Deliver material to job site LU5: Position HVAC equipment LU6: Install duct system(verify installation of duct) LU7: Install flues /Smoke pipes (verify installation of flues/ smoke pipes) LU8: Install control wiring LU9: Install refrigerant piping LU10: Perform evacuation and dehydration of refrigeration system LU11: Install primary wiring	140 hours

	<p>LU12: Install fuel piping</p> <p>LU13: Install condensate drain piping</p> <p>LU14: Mount supply and return air (Duct) terminals</p> <p>LU15: Seal structural penetration</p> <p>LU16: Mount control systems</p> <p>LU17: Refrigerant charging</p>	
3: Remove existing HVAC unit	<p>LU1: Remove refrigerant and biohazards</p> <p>LU2: Lock out energy sources</p> <p>LU3: Disconnect electrical wiring from equipment</p> <p>LU4: Disconnect vent piping from equipment</p> <p>LU5: Disconnect fuel piping to equipment</p> <p>LU6: Disconnect duct work to equipment</p> <p>LU7: Disconnect refrigerant piping to equipment</p> <p>LU8: Disconnect water piping to equipment</p> <p>LU9: Remove HVAC equipment</p> <p>LU10: Dispose-off removed items</p>	100 hours
4: Test HVAC unit performance	<p>LU1: Check HVAC equipment electrical characteristics</p> <p>LU2: Verify gas pressure at equipment</p> <p>LU3: Verify water supply to equipment</p> <p>LU4: Verify design CFM</p> <p>LU5: Measure Temperature</p> <p>LU6: Identify condition of combustion chamber</p> <p>LU7: Measure relative humidity</p> <p>LU8: Check modes of operation</p> <p>LU9: Perform motor Test(s)</p> <p>LU10: Perform Compressor Efficiency Test</p>	100 hours
5: Conduct Preventive Maintenance on HVAC Equipment	<p>LU1: Inspect HVAC system components</p> <p>LU2: Clean heat exchangers</p> <p>LU3: Clean burners</p> <p>LU4: Clean blower assembly</p> <p>LU5: Clean air filters</p> <p>LU6: Replace filters</p> <p>LU7: Lubricate HVAC motors and bearings</p> <p>LU8: Replace belts</p> <p>LU9: Adjust belt alignment and tension</p>	140 hours

<p>6: Repair Refrigeration Cycle</p>	<p>LU1: Obtain replacement part(s)          LU2: Replace motors          LU3: Replace compressors          LU4: Replace refrigeration dryers          LU5: Replace valves          LU6: Replace controls          LU7: Repair electrical wiring          LU8: Replace electrical parts          LU9: Replace Electronics circuits/cards          LU10: Replace sensors          LU11: Replace heat exchangers          LU12: Replace gas kits          LU13: Repair mechanical Damages</p>	<p>140 hours</p>
<p>07: Develop Professionalism</p>	<p>LU1: Communicating with co-worker          LU 2: Managing time          LU 3: Upgrading skills          LU 4: Keeping the workplace clean          LU 5: Working within a team</p>	<p>36hours</p>

## TRAINER GUIDELINES

### Module 01: Initiate HVAC Work

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<b>LU1: Follow dress code</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Importance of Personal safety measures</li> <li>• Work place safety measures</li> <li>• Utilization of PPE (Personal Protective Equipment).</li> <li>• Perform workplace safety according to standard procedures of trade</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p>Work shop / Lab</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White board</li> <li>• Charts</li> <li>• Learner Guide</li> </ul>
<b>LU2: Clean up service vehicle</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Light-Vehicle rule and regulations according to standards</li> <li>• Physical fitness of Vehicle</li> <li>• Travel route of jobsite</li> <li>• importance of water level in battery</li> <li>• Basic electrical maintenance of vehicle</li> <li>• Basic mechanical maintenance</li> <li>• Positive attitude during drive</li> </ul> <p>Conduct a question and answer session with learners.</p>	<p>Classroom</p> <p>Classroom</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p>Work shop</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p>Class room</p> <p>Work shop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White board</li> <li>• Charts</li> <li>• Learner guide</li> </ul>
<b>LU3: Clean up Job site</b>	<p>Give lecture and illustrative talk on the following learning elements:</p>	Class room	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White</li> </ul>

	<ul style="list-style-type: none"> <li>• Good housekeeping according to organization standards</li> <li>• Arrange clear light and proper ventilation</li> <li>• Work ethics</li> <li>• Toxic material prevention at job site</li> <li>• Disposing-off methods of Garbage.</li> <li>• Explain 5S</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<p>board</p> <ul style="list-style-type: none"> <li>• Charts</li> <li>• Learner Guide</li> </ul>
<b>LU4: Perform maintenance of tools (maintain tools)</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Identification of tools and equipment</li> <li>• Functions of tools and equipment</li> <li>• Use of tools and equipment</li> <li>• Maintenance of tools and equipment according to standards</li> <li>• Store tools and equipment as described</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Work shop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Learner Guide</li> <li>• Charts</li> <li>• White Board</li> </ul>
<b>LU5: Perform maintenance on test equipment (maintain test equipment)</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Identification of test equipment</li> <li>• Functions and use of test equipment</li> <li>• Basic Electrical Values(voltage, current, resistance, power)</li> <li>• Basic mechanics(vibration, noise, humidity, air pressure, atmospheric pressure,)</li> <li>• Describe Boyle's law</li> <li>• Describe Charles Law</li> <li>• Refrigerant and properties of best/common Refrigerants.</li> </ul>	<p>Class room</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Learner Guide</li> <li>• Charts</li> <li>• White Board</li> <li>• Models</li> <li>• Multi-media</li> </ul>

	<ul style="list-style-type: none"> <li>• Effect of pressure on Boiling point &amp; on Temperature</li> <li>• Basic refrigeration cycle</li> <li>• Air Conditioning</li> <li>• Conditioned Space</li> <li>• Psychometric chart</li> <li>• Use of test equipment</li> <li>• Maintenance of test equipment as described</li> <li>• Store test equipment as described standards</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>-do-</p> <p>Work shop</p> <p>-do-</p> <p>-do-</p> <p>Class room</p>	
<b>LU6: Report safety violations</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Safety rules and regulations of HVACR workshop</li> <li>• Electric short circuit and reasons of short circuit</li> <li>• Basic fire fighting equipment and their usage</li> <li>• Hazards material(electrical, mechanical and chemical in HVARC filed)</li> <li>• Emergency procedure of workshop</li> <li>• Filling of job cards and procedure of safety reporting</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Class room</p>	<ul style="list-style-type: none"> <li>• Learner Guide</li> <li>• White Board</li> <li>• Multi-media</li> </ul>

<p><b>LU7: Delegate work to subordinate</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Job requirement in context of human resource</li> <li>• Delegation of job responsibility to subordinate as requisition of job</li> <li>• Job distribution according to plan described</li> <li>• Demonstrate Quality</li> <li>• Assure quality assurance of workers performance</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Class room</p>	<ul style="list-style-type: none"> <li>• Learner Guide</li> <li>• White Board</li> <li>• Multi-media</li> </ul>
<p><b>LU8: Obtain material from Store</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Identify material as requested for job</li> <li>• Quality and Quantity of material</li> <li>• Proceed Store requisition</li> <li>• Check material as per standards of HVACR field</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Learner Guide</li> <li>• White Board</li> </ul>

Module 02: Install HVAC Units

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<b>LU1: Identify job specifications</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Job card/Work Order/Complaint Sheet</li> <li>• List of tools and equipment as required for job</li> <li>• Toolkit according to job requirement</li> <li>• Handling of equipment and tools as described standards</li> <li>• Selection of manpower according to job specification</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>Classroom /workshop</p> <p>Work shop</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p> <p>Work shop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU2: Verify field locations and measurements</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Field visit parameters job location</li> <li>• Effect of surrounding medium on Conditioned Space.</li> <li>• Basic Heating/Cooling load calculation.</li> <li>• HVAC BTU, Ton of refrigeration (TR) and Watt.</li> <li>• Ventilation and Infiltration</li> <li>• Rules of Heat</li> <li>• Types of Heat</li> <li>• Checking of resources at job site</li> <li>• Estimation of materials according to measurements</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>class room</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU3: Obtain specified equipment</b>	<p>Give lecture and illustrative talk on the following learning elements:</p>	<p>Class room</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White</li> </ul>

	<ul style="list-style-type: none"> <li>• Identification of job as described</li> <li>• Store issuance procedure</li> <li>• Selection of equipment according to job description</li> <li>• Equipments physical condition</li> <li>• Physical inspection</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Class room</p>	<p>Board</p> <ul style="list-style-type: none"> <li>• Learner Guide</li> </ul>
<b>LU4: Deliver material to job site</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Specification of equipment</li> <li>• Safety measures of loading/unloading</li> <li>• Handling of equipment machines</li> <li>• Procedure of equipment delivery and acknowledgement</li> <li>• Importance of documentation, against Handing / Taking over of an Equipment</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Class room</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 5: Position HVAC equipment</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Importance of base/foundation</li> <li>• Commissioning steps of equipment</li> <li>• Ensure commissioning work</li> <li>• Safety steps of equipment installation/position</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Class room</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 6: Install duct system(verify installation of duct)</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Duct drawing according to jobsite</li> <li>• Usage of Ductolator</li> <li>• CFM and its calculation</li> <li>• Verification of duct measurements according to</li> </ul>	<p>Classroom</p> <p>-do-</p> <p>Classroom</p> <p>Work shop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	<p>drawing.</p> <ul style="list-style-type: none"> <li>• Checking Procedures of duct according to drawing</li> <li>• Checking of Hangers, and joints of duct (Hanger's strength)</li> <li>• Smoke/ Light test of duct according to Standard</li> <li>• Insulation of duct and type of insulation,</li> <li>• Wrapping procedure of duct</li> <li>• Describe sound liner/barrier</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	
<b>LU7:Install flues /Smoke pipes (verify installation of flues/ smoke pipes)</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• flues/smoke pipe rout according to drawing</li> <li>• checking procedure of flues/smoke pipe according to drawing</li> <li>• flues/smoke pipe, hanger, joints, height of pipes according to drawing</li> <li>• Flues/Smoke pipes insulation check according to standards</li> <li>• Flow rate and its calculation</li> <li>• Problems of vibration in piping</li> <li>• MS Pipe Standard schedule (40 &amp; 60)</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU8:Install control wiring</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Control wiring drawing and control symbols</li> <li>• Types of wires in control wiring and standards</li> <li>• Control Wiring Circuits</li> <li>• Control circuit wiring according to drawings</li> <li>• Color coding of control wires</li> </ul>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	<ul style="list-style-type: none"> <li>• Types of wiring joints</li> <li>• Series &amp; parallel circuits</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Workshop -do-</p> <p>Workshop</p>	
<b>LU9: Install refrigerant piping</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Pipe types and pipe joints</li> <li>• Pipe jointing methods</li> <li>• Perform pipe joints of refrigerant in HVAC</li> <li>• leakage test and procedure</li> <li>• Importance of Hangers in piping system</li> <li>• Insulation of refrigerant pipe according to drawing</li> <li>• Insulation of refrigerant pipe according to drawings and requirement</li> <li>• Fabrication of refrigerant pipes according to drawing</li> <li>• Color coding standards of pipes</li> <li>• Perform color coding of pipe according to drawing</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 10: Perform evacuation and dehydration of refrigeration system</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types of Gauges use in HVAC</li> <li>• Perform measurement with Compound Gauge</li> <li>• Flushing procedure of according to standards</li> <li>• Safety measure according to Gases and Environment</li> <li>• Importance of Vacuuming in a Refrigeration system</li> <li>• Perform flush with Nitrogen gas and other Cleaning Chemicals.</li> </ul> <p>Assign a group activity to learners</p>	<p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	to visit a workshop to identify/enlist hazards and their precautions.	Workshop	
<b>LU11:Install primary wiring</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Primary wiring drawing</li> <li>• Types of wires in primary wiring and standards</li> <li>• Primary wiring Circuits, phase sequence, Star &amp; Delta</li> <li>• Perform primary Circuit Wiring according to drawings</li> <li>• Assure primary Circuits Wiring according to drawing</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU12:Install fuel piping</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Pipes types and pipe joints</li> <li>• Perform pipe joints of fuel in HVAC</li> <li>• Leakage test and procedure</li> <li>• Fabrication of fuel pipes according to drawing</li> <li>• Color coding standards of Pipes</li> <li>• Perform color coding of Pipe according to drawing</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU13:Install condensate drain piping</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Pipe types and pipe joints</li> <li>• Perform pipe installation and joints of drain in HVAC</li> <li>• leakage test and procedure</li> <li>• Steam Trap</li> <li>• Color Coding standards of pipes</li> <li>• Color Coding of pipe according to</li> </ul>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	<p>drawing</p> <ul style="list-style-type: none"> <li>• Leveling procedure of drain pipe</li> <li>• Leveling of drain pipe</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>-do-</p> <p>Workshop</p>	
<b>LU14:Mount supply, return and fresh air Ducts</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Supply, return and fresh air duct rout according to drawing</li> <li>• Air mixing chamber and filtration</li> <li>• Types of filters, air dumper, diffuser, grills, vibration eliminators</li> <li>• Checking procedure of supply and return air duct according to drawing</li> <li>• Hangers and joints of supply and return air duct.</li> <li>• Perform supply and return air duct insulation, check according to standards</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU15:Seal structural penetration</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• sealing materials of structure and insulations</li> <li>• Perform sealing on wall, ceiling, underground</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

<p><b>LU16:Mount control systems</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Control System mounting position</li> <li>• Procedure of placement of control system according to environment and access</li> <li>• Functions of control system and application</li> <li>• Checking of control system results, parameters</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<p><b>LU17:Refrigerant charging</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Evacuation, Purging process as per requirement</li> <li>• Charging methods (by weight, vapors, Pressure temperature relation)</li> <li>• Purging according to standard</li> <li>• Charge Refrigerant in System</li> <li>• Test run of system accordingly and check parameter</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

Module 03: Remove existing HVAC unit

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<b>LU 1: Remove Refrigerant and Biohazards</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Differentiating between Ozone friendly and Ozone depleting refrigerants</li> <li>• Recovery, Recycling and Reclaiming of Refrigerants</li> <li>• Installation of recovery unit</li> <li>• Removal of recovery unit</li> <li>• Reclaiming process of refrigerants</li> <li>• Recycling process of refrigerants</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 2: Lock out Energy Sources</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Safety rules of Electrical Hazards, mechanical, Fuel Biohazards</li> <li>• Procedure of tagging system, and standards</li> <li>• Procedure of disconnection of electrical fuel source</li> <li>• Disconnection of Electrical Power Source</li> <li>• Disconnection of Fuel Supply System</li> <li>• Tagging of Electrical Wire and Pipes of HVARC system</li> <li>• Importance of dead/block Refrigerant Pipe (open circuit)</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 3: Disconnect electrical wiring</b>	<p>Give lecture and illustrative talk on the following learning elements:</p>	<p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White</li> </ul>

<p><b>from equipment</b></p>	<ul style="list-style-type: none"> <li>• Color Coding of wiring</li> <li>• Methods of removing main Electrical Wiring</li> <li>• Methods of removing control Electrical Wiring</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<p>Board</p> <ul style="list-style-type: none"> <li>• Learner Guide</li> </ul>
<p><b>LU 4: Disconnect Vent Piping from Equipment</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Ventilation process</li> <li>• Identification of marked vent points</li> <li>• Isolating vent piping from equipment</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<p><b>LU 5: Disconnect Fuel Piping from Equipment</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types and usage of Fuel System</li> <li>• Valve and its types</li> <li>• Marking of fuel points</li> <li>• Isolation of Fuel Piping system from equipment</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do- Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<p><b>LU 6: Disconnect Duct Work From Equipment</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Importance of ducting system</li> <li>• Types of ducting system</li> <li>• Marking of ducting points</li> <li>• Types of insulation material</li> <li>• Demonstrate to insulate and insulation removing process</li> <li>• Isolating methods of ducting from equipment</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do- Workshop</p> <p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

<b>LU 7: Disconnect refrigerant piping from equipment</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Pump Downing method</li> <li>• Marking of Refrigerant Piping Points according to Color Coding</li> <li>• Types of insulation material</li> <li>• Demonstrate to insulate and insulation removing process</li> <li>• Isolating methods of Refrigerant Piping from equipment</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 8: Disconnect water piping from equipment</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Different Piping Systems in Chillers</li> <li>• Types of water control valves such as gate valves, glove valves, check valves, water flow valves, strainers etc.</li> <li>• Demonstrate marking of water Piping Points according to Color Coding</li> <li>• Working principles of Gate Valve</li> <li>• Types of Insulation Material</li> <li>• Insulation and insulation removing process</li> <li>• Isolating methods of water piping from equipment</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 9: Remove HVAC equipment</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Working principles of Hoisting Machine</li> <li>• Attachment of Hoisting Machine with HVAC equipment and lifting methods</li> <li>• Isolating methods of HVAC equipment from foundation</li> </ul> <p>Assign a group activity to learners</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	to visit a workshop to identify/enlist hazards and their precautions.	Workshop	
<b>LU 10: Dispose-off Removed Items</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Safe and appropriate practices for picking up removed items.</li> <li>• Safety measures e.g. handling, storing, and disposing-off removed items.</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

Module 04: Test HVACs Unit Performance

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<b>LU 1: Check HVAC Equipment Electrical Characteristics</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Electrical Earth procedure</li> <li>• Earth Leakage Breaker and earth testing equipments</li> <li>• Voltage drop on load and effect of low voltage</li> <li>• Procedure of system voltage test</li> <li>• HVAC current follow measurement procedures</li> <li>• Perform Electrical Voltage, current, earth leakage test and record parameters</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 2: Verify Gas Pressure At Equipment</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• HVAC equipment rating and standards</li> <li>• Pressure Gauge installation procedures</li> <li>• Measurements of pressure with Gauges and note parameters</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU3: Verify water supply to equipment</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Hydronic System and standards</li> <li>• Pressure Gauge installation procedures of water system</li> <li>• Measurement of water pressure with gauges and note parameters</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

<b>LU 4: Verify design CFM</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• CFM calculation and air velocity measurement procedures</li> <li>• CFM testing at fan outlet, room outlet according to requirement and standards</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 5: Measure Temperature</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Temperature units and conversion</li> <li>• Comfort level/zone according to standards</li> <li>• Wet bulb and dry bulb temperature</li> <li>• Procedure of temperature measurement of air, water, refrigerant</li> <li>• Temperature measurement of air, water, refrigerant and note parameters</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 6: Identify condition of combustion chamber</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types of Fuel and Fuelling systems</li> <li>• Types of flame, and procedure of flaming of Combustion Chamber</li> <li>• Effect on Flame</li> <li>• Flaming operation according to requirement</li> <li>• Flue gases, calorific values of fuels</li> <li>• Effect of Flue gases on Environment</li> <li>• Checking of flue gases with pressure gauges and smoke</li> </ul>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	<p>detectors</p> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>		
<b>LU 7: Measure Relative Humidity</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Psychometric properties of Air</li> <li>• Relative Humidity</li> <li>• humidistat application procedure</li> <li>• Use of Humidistat</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 8: Check Modes Of Operation</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Refrigeration Cycle</li> <li>• Performance check chart(weekly, monthly, quarterly half year, yearly)</li> <li>• Humidifier and DE-humidifier</li> <li>• HVAC symbols, ducts and pipes symbols, and HVACR Mechanical symbols.</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Workshop</p> <p>Workshop</p> <p>-do-</p> <p>Classroom</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Models</li> </ul>
<b>LU 9: Perform Motor Test(s)</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Alignment Tools and procedure</li> <li>• Noise and Levels</li> <li>• Vibration</li> <li>• Alignment of motors</li> <li>• Checking of noise level with dB (Decibel) meter</li> <li>• Checking of vibration with Vibration Meter</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 10: Perform Compressor</b>	<p>Give lecture and illustrative talk on the following learning elements:</p>	<p>Classroom</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White</li> </ul>

<b>Efficiency Test</b>	<ul style="list-style-type: none"> <li>• Compressor operation</li> <li>• Suction and discharge pressure</li> <li>• Compressor Lubrication</li> <li>• Compressor safety devices(overload, Low Pressure Switch, High Pressure Switch, Oil Pressure Switch, Dual Pressure Switch, water flow switch)</li> <li>• Compressor and it types</li> <li>• Suction and discharge pressure checking procedure</li> <li>• Checking of suction pressure with Low Pressure Gauge</li> <li>• Checking of discharge pressure with High Pressure Gauge</li> <li>• Checking of Noise level with dB meter</li> <li>• Checking of Compressor motor Current with clamp-on meter( Tongs-Tester)</li> <li>• Parameters of Compressor</li> <li>• Standard parameter/specification of compressor</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p style="text-align: center;">-do- Classroom</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">Workshop</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">Workshop</p>	<p>Board</p> <ul style="list-style-type: none"> <li>• Learner Guide</li> </ul>
------------------------	--	---	--

Module 05: Conduct Preventive Maintenance on HVAC Equipment

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<b>LU 1: Inspect HVAC System Components</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Electrical Component checking procedure</li> <li>• Mechanical Component checking procedure</li> <li>• Problem due to carbon in Electrical Circuit/Connection</li> <li>• Physical condition of Evaporator and Condenser</li> <li>• Checking procedure of Evaporator, Condenser and compare with standards parameters</li> <li>• Physical condition of Evaporator, Condenser according to standards</li> <li>• Preventive maintenance charts, schedule and recording procedure of charts</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 2: Clean heat exchangers</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Cleaning chemicals and material characteristics</li> <li>• Cleaning procedures of air filter, coils and pipes</li> <li>• Internal, external cleaning procedures</li> <li>• Types of Air Filter</li> <li>• Air Filter cleaning procedures</li> <li>• Air Filter cleaning</li> <li>• Evaporator and Condenser cleaning</li> <li>• Drain Pipe cleaning</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	hazards and their precautions.		
<b>LU 3: Clean Burners</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Burner and its types</li> <li>• Demonstrate dismantling and assembling of Burners</li> <li>• Cleaning chemicals and material characteristics</li> <li>• Internal, external cleaning procedures</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 4: Clean Blower Assembly</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Blower and its types</li> <li>• Dismantling and assembling procedures</li> <li>• Dismantling and assembling of blowers</li> <li>• Cleaning materials characteristics</li> <li>• Cleaning parts and mechanical parts of blower</li> <li>• Lubrication of mechanical(moving) parts of blower(blade, bearings, etc)</li> <li>• Internal and external cleaning procedures</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 5: Clean air filters</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types of air filter</li> <li>• Cleaning chemicals and material characteristics</li> <li>• Cleaning procedures of Air Filter</li> <li>• Re-assembling of Air Filters</li> </ul> <p>Assign a group activity to learners</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	to visit a workshop to identify/enlist hazards and their precautions.		
<b>LU 6: Replace Filters</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types of Filter</li> <li>• Checking procedure of physical condition of Filters</li> <li>• Removal/Replacement procedures of Filters</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 7: Lubricate HVAC motors and bearings</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Type of motors and structure</li> <li>• Circulation Pumps and its types</li> <li>• Lubrication of Bearings</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 8: Replace belts</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types of belts and procedure of replacement</li> <li>• Pulleys</li> <li>• Replacement of Belts</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 9: Adjust belt alignment and tension</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Alignment procedure and tools</li> <li>• Noise level checking procedure</li> <li>• Performing alignment of belt</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Class room</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

## Module 06: Repair Refrigeration Cycle

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<b>LU 1: Obtain replacement part(s)</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Specification of parts</li> <li>• Procedure of checking of parts</li> <li>• Requisition procedure of parts</li> <li>• Demonstrate mechanical components checking</li> <li>• Receiving procedure from store</li> <li>• Receiving of parts from store</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 2: Replace motors</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Dismantling and installation procedure of motors</li> <li>• Removal of motors</li> <li>• Electrical Connections of motors</li> <li>• Installation of motor</li> <li>• Coupling System</li> <li>• Alignment of Motor</li> <li>• Connection of Electrical Supply as described</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 3: Replace compressors</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Recovery procedure of refrigerant</li> <li>• Disconnection procedure of pipes from compressor</li> <li>• Recovery of refrigerant from system</li> <li>• Replacement procedure of compressor</li> <li>• Connection of refrigerant pipes</li> <li>• Leak Test procedure</li> </ul>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p> <p>Workshop</p> <p>-do-</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>

	<ul style="list-style-type: none"> <li>• Leak Test</li> <li>• Electrical supply of compressor</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	Workshop	
<b>LU 4: Replace Refrigeration Dryers (Core/Filer)</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types and use of drier</li> <li>• Dismantling procedure</li> <li>• Replacement of core(drier)/drier filter</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 5: Replace Valves</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types and use of valves</li> <li>• Dismantling procedure of valves</li> <li>• Replacement of valves</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 6: Replace controls</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Types of Controls</li> <li>• Dismantling procedure of Control</li> <li>• Replacement of Control</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>Workshop</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> </ul>
<b>LU 7: Repair electrical wiring</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Type of electrical connections</li> <li>• Checking of electrical connections</li> <li>• Types of insulation</li> <li>• Electrical connection test</li> <li>• Continuity test of connections</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>-do-</p> <p>Workshop</p> <p>Classroom</p> <p>Workshop</p> <p>-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>

<b>LU 8: Replace electrical parts</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• electrical parts replacement procedure</li> <li>• Replacing of electrical parts</li> <li>• Functionality test before installation.</li> <li>• Re-Connection of newly installed parts</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p style="text-align: center;">-do-</p> <p>Workshop</p> <p style="text-align: center;">-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 9: Replace Electronics circuits/cards</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Electronics Cards replacement procedure</li> <li>• Color Coding of Resistance</li> <li>• Replacement of Cards</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p style="text-align: center;">-do-</p> <p>Workshop</p> <p style="text-align: center;">-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 10: Replace Sensors</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Type of sensors</li> <li>• Replacement procedure of sensors</li> <li>• Evaluation of Sensor and Alternate</li> <li>• Replacement of sensors</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p style="text-align: center;">-do-</p> <p>Classroom Workshop</p> <p style="text-align: center;">-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>

<b>LU 11: Replace heat exchangers</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Heat Exchanger, Condenser and Evaporator replacement procedure</li> <li>• Replacement of Condenser and Evaporator</li> <li>• Absorption System and crystallization in Absorption Chillers</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p style="text-align: center;">-do-</p> <p>Workshop</p> <p style="text-align: center;">-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 12 : Replace gas kits</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• types of gas kits</li> <li>• Replacement procedure of gas kits</li> <li>• Replacement of gas kits</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p style="text-align: center;">-do-</p> <p>Workshop</p> <p style="text-align: center;">-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 13: Repair mechanical Damages</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Mechanical repairing procedure</li> <li>• Aligning procedure of door</li> <li>• Alignment of door</li> <li>• Replacement procedure of door components</li> <li>• Replacement of door components</li> <li>• Door cap repairing</li> <li>• Leveling foot screw</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p>Workshop</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p style="text-align: center;">-do-</p> <p>Workshop</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>

Module 07: Develop Professionalism

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p><b>LU1: Communicating with co-worker</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Communication Tools</li> <li>• Communication ethics</li> <li>• Dealing with vendors and other organisations.</li> <li>• Appropriate use of electronic and relative media when required</li> <li>• Effective communication with Junior staff and Co workers</li> <li>• Communication within the department and interaction with other departments</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Classroom</p> <p>-do-</p> <p>Classroom</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<p><b>LU 2: Managing time</b></p>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Importance of Punctuality</li> <li>• Maintaining task calendars</li> <li>• Importance of multitasking</li> <li>• Checking of work (self / supervisors)</li> <li>• Importance of managing time according to task priorities, involving management and co-workers.</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist</p>	<p>Classroom</p> <p>Classroom</p> <p>Classroom</p> <p>Classroom</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>

	hazards and their precautions.		
<b>LU 3: Upgrading skills</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Importance of staying up-to-date</li> <li>• Development of personal skills and efficiency</li> <li>• Improvement of skill sets over time by way of seminars, workshops and competitions.</li> <li>• Importance of trends and market research to work role</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Classroom</p> <p>Classroom</p> <p>Classroom</p> <p>Classroom</p> <p>classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 4: Keeping the workplace clean</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Requirements of a clean and organised workplace</li> <li>• Effective and efficient organisation of work area</li> <li>• Importance of hygiene</li> </ul> <p>Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.</p>	<p>Classroom</p> <p>Classroom</p> <p>Classroom</p> <p>-do-</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>
<b>LU 5: Working within a team</b>	<p>Give lecture and illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Skills required to successfully participate in teams</li> <li>• Workplace standards for professional appearance as a HVACR technician</li> <li>• Interpersonal skills required to work within teams</li> <li>• Requirements for work ethics for HVACR technician role.</li> </ul>	<p>Classroom</p> <p>-do-</p> <p>-do-</p> <p>-do-</p> <p>Classroom</p>	<ul style="list-style-type: none"> <li>• Multi-media</li> <li>• White Board</li> <li>• Learner Guide</li> <li>• Charts</li> </ul>

	Assign a group activity to learners to visit a workshop to identify/enlist hazards and their precautions.	Classroom	
--	---	-----------	--

## National Vocational and Technical Training Commission (NAVTTTC)

 5th Floor Evacuee Trust Complex Sector F-5/1, Islamabad.

 +92 51 9044 04

 +92 51 9044 04

 [info@navttc.org](mailto:info@navttc.org)

 [www.navttc.org](http://www.navttc.org)