Model Curriculum

QP Name: HVAC Technician

QP Code: ELE/Q3112

QP Version: 3.0

NSQF Level: 4

Model Curriculum Version: 3.0

Electronics Sector Skills Council of India || 155, 2ⁿᵈ Floor, ESC House, Okhla Industrial Area – Phase 3, New Delhi -110020

Table of Contents

Training Parameters

Sector	Electronics
Sub-Sector	Consumer Electronics & IT Hardware
Occupation	After Sales Support
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3115.1100
Minimum Educational Qualification and Experience	8th Grade Pass + NTC (2 years after 8th) + 2 Year NAC/relevant Experience) OR 10th Grade pass + 2 Year NTC/NAC/ relevant experience OR Certificate-NSQF (Level-3 in Maintenance Technician) with 2 Years of relevant Experience OR 12th Class and 18 Years
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	27/01/2022
Next Review Date	27/06/2025
NSQC Approval Date	27/01/2022
QP Version	3.0
Model Curriculum Creation Date	27/01/2022
Model Curriculum Valid Up to Date	27/06/2025
Model Curriculum Version	3.0
Maximum Duration of the Course	600 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills:

- Discuss how to engage with customer for service of HVAC System

- Demonstrate the Process of Servicing, troubleshooting and repairing a HVAC system (chillers)

- Explain the importance of following inclusive practices for all genders and PwD at work.

- Demonstrate various practices to be followed to maintain health and safety at work.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Recommended)	On-the-Job Training Duration (Mandatory)	Total Duration
Bridge Module	**06:00**	**04:00**	**00:00**	**00:00**	**10:00**
Module 1: Introduction and orientation to the role of a HVAC Technician	06:00	04:00	00:00	00:00	10:00
ELE/N3101: Engage with customer for service of HVAC system	**30:00**	**60:00**	**00:00**	**30:00**	**120:00**
Module 2: Engage with customer for service of HVAC System	30:00	60:00	00:00	30:00	120:00
ELE/N3140: Service, troubleshoot and repair a HVAC system (chillers)	**30:00**	**60:00**	**00:00**	**60:00**	**150:00**
Module 3: Process of Servicing, troubleshooting and repairing a HVAC system (chillers)	30:00	60:00	00:00	60:00	150:00
ELE/N3141: Service, troubleshoot and repair packaged type HVAC ducted system	**60:00**	**80:00**	**00:00**	**60:00**	**200:00**

Module 4: Process of servicing, troubleshooting and repairing packed type HVAC ducted system	60:00	80:00	00:00	60:00	200:00
ELE/N9905 Work effectively at the workplace	**15:00**	**15:00**	**00:00**	**00:00**	**30:00**
Module 5: Soft Skills and Work Ethics	15:00	15:00	00:00	00:00	30:00
ELE/N1002 Apply health and safety practices at the workplace	**15:00**	**15:00**	**00:00**	**00:00**	**30:00**
Module 6: Basic Health and Safety Practice	15:00	15:00	00:00	00:00	30:00
DGT/VSQ/N0102- Employability Skills (60 Hours)	**24:00**	**36:00**	**00:00**	**00:00**	**60:00**
Module 7: Employability Skills (60 Hours)	24:00	36:00	00:00	00:00	60:00
Total Duration	**180:00**	**270:00**	**00:00**	**150:00**	**600:00**

Module Details

Module 1: Introduction and orientation to the role of a HVAC Technician
Bridge Module

Terminal Outcomes:

- Discuss the job role of a HVAC Technician.

Duration: 06:00	Duration: 04:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Describe the size and scope of the electronic industry and its sub-sectors. - Discuss the role and responsibilities of a HVAC Technician. - Describe various employment opportunities for a HVAC Technician.	Familiarization with the tools used in HVAC Technician.
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
NA	

Module 2: Engage with customer for service of HVAC System
Mapped to ELE/N3101

Terminal Outcomes:

- Explain the importance of interacting with the client prior to initiating work.
- Describe the process of collating the work requirements.
- Demonstrate the process of providing possible solutions to the client.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Identifying the requirement of service and repair by interacting with the client and supervisors - Analyse the drawings and layouts of site - Identify the possible solutions and suggest to client - Plan work schedule and collect tools equipment from store - Deliver quality work to get client satisfaction and positive feedback	Demonstrate effective communication while interacting with the customer supervisor to get work requirement and work schedule
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
HVAC system specification document, Warranty and service details	

Module 3: Service, troubleshoot and repair a HVAC system (chillers)
Mapped to ELE/N3140

Terminal Outcomes:

- Demonstrate the process of performing maintenance of the system.
- Demonstrate the process of troubleshooting and repairing the system.
- Explain the importance of checking the performance after service and/or repair.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Perform maintenance of a cooling tower and chiller - Use proper equipment to clean duct work, AHU and FCU - Analyse and check water pipelines and pumps for any damage - Devise solutions to fix faults in electrical control panels and supply boxes - Analyse customer input or complain to identify the issue - Identify and fix the faulty units in chiller and cooling tower - Identify and fix faults in the AHU, FCU and ducts for faults - Evaluate and repair the electrical connections, Earthing and motor issues - Examine the air flow through ducts and temperature range in different regions - Identify the fault and perform replacement of faulty modules such as condenser, evaporator, filter and so on - Examine the system performance as per ISHRAE/ASHRAE and contract standards. - Examine the air flow and electrical parameters to calculate efficiency of the system	- Comply with the service and maintenance documents of HVAC system - Use appropriate tools and equipment for maintenance and service - Prepare maintenance and service records - Perform basic troubleshooting steps to identify issues in chiller and cooling tower - Record and report the repair work done
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	

Tools, Equipment and Other Requirements

Basic tool kit: Philips screw driver, plier set, flashlight, wrench set, Clamp meter, anemometer, Personal protective equipment: Safety shoes, gloves, mask, helmet, goggles Dx chiller package, cooling tower, AHU, FCU, duct work, water pipes and motors, electrical panels, Logbooks, maintenance and service records, Basic tool kit: Philips screw driver, plier set, flashlight, wrench set, Clamp meter, anemometer, Personal protective equipment: Safety shoes, gloves, mask, helmet, goggles

Module 4: Process of servicing, troubleshooting and repairing packed type HVAC ducted system

Mapped to ELE/N3141

Terminal Outcomes:

- Demonstrate the process of performing service repair of duct system.
- Demonstrate the process of performing service repair of packaged type HVAC system.
- Demonstrate the process of checking performance of ducts and packaged system required.

Duration: 60:00	Duration: 80:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Identify the components of a packaged type HVAC ducted system. - Ensure safety while repairing and filling gas - Identify any fault in beam clamp, conduit, dampers, pipe hanger, duct hanger and the refrigeration system - Inspect return air, supply air and duct sizes	- Perform maintenance of compressor, condenser, evaporator and motor - Perform cleaning of coils, fan and filter - Replace the faulty modules - Check refrigerant leakage - Document and report about the work done - Check bend, kink or crack in ducts - Perform cleaning of ducts by robotic/manual methods - Tighten all insulation and acoustic seals

Classroom Aids
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop

Tools, Equipment and Other Requirements
Packaged type HVAC system, Duct system, refrigerant gas filling apparatus, Logbooks, maintenance and service records, Basic tool kit: Philips screw driver, plier set, flashlight, wrench set, Clamp meter, anemometer, Personal protective equipment: Safety shoes, gloves, mask, helmet, goggles

Module 5: Soft Skills and Work Ethics
Mapped to ELE/N9905

Terminal Outcomes:

- Work effectively at the workplace.
- Implement the practices related to gender and PwD sensitization.

Duration: 15:00	Duration: 15:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- State the importance of work ethics and workplace etiquette - State the importance of effective communication and interpersonal skills. - Explain ways to maintain discipline at the workplace. - Discuss the common reasons for interpersonal conflict and ways of managing them effectively. - Discuss the importance of following organisational guidelines for dress code, time schedules, language usage and other behavioural aspects. - Explain the importance of working as per the workflow of the organisation to receive instructions and report problems. - Explain the importance of conveying information/instructions as per defined protocols to the authorised persons/team members. - Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information. - Describe the process of reporting grievances and unethical conduct such as data breaches, sexual harassment at the workplace, etc. - Explain the concept and importance of gender sensitivity and equality. - Discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD).	- Develop a sample plan to achieve organisational goals and targets. - Create a sample feedback form to obtain feedback from customers, colleagues etc. - Roleplay to demonstrate the use of professional language and behaviour that is respectful of PwD and all genders. - Apply organisational protocol on data confidentiality and sharing only with the authorised personnel.

• Discuss ways of dealing with heightened emotions of self and others.	

Classroom Aids

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop

Tools, Equipment and Other Requirements

Sample Of Escalation Matrix, Organization Structure.

Module 6: Basic Health and Safety Practice
Mapped to ELE/N1002

Terminal Outcomes:

- Apply health and safety practices at the workplace.

Duration: 15:00	Duration: 15:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Discuss job-site hazards, risks and accidents. - Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials. - Elaborate on electronic waste disposal procedures. - Describe the process of disposal of hazardous waste - List the name and location of concerned people, documents and equipment for maintaining health and safety in the workplace. - Describe how to interpret warning signs while accessing sensitive work areas. - Explain the importance of good housekeeping. - Describe the importance of maintaining appropriate postures while lifting heavy objects. - List the types of fire and fire extinguishers. - Explain the importance of efficient utilisation of water, electricity and other resources. - List the common sources of pollution and ways to minimize it. - Describe the concept of waste management and methods of disposing hazardous waste. - Explain various warning and safety signs. - Describe different ways of preventing accidents at the	- Demonstrate the use of protective equipment suitable as per tasks and work conditions. - Prepare a report to inform the relevant authorities about any abnormal situation/behaviour of any equipment/system. - Administer first aid in case of a minor accident. - Demonstrate the steps to free a person from electrocution safely. - Administer Cardiopulmonary Resuscitation (CPR). - Demonstrate the application of defined emergency procedures such as raising alarm, safe/efficient, evacuation, moving injured people, etc. - Prepare a sample incident report. - Use a fire extinguisher in case of a fire incident. - Demonstrate the correct method of lifting and handling heavy objects.

workplace.

Classroom Aids

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop

Tools, Equipment and Other Requirements

Personal Protection Equipment: Safety Glasses, Head Protection, Rubber Gloves, Safety Footwear, Warning Signs and Tapes, Fire Extinguisher, First Aid Kit, Fire Extinguishers and Warning Signs.

Module 7: Employability Skills (60 Hours)
Mapped to DGT/VSQ/N0102

Terminal Outcomes:

- Discuss about Employability Skills in meeting the job requirements
- Describe opportunities as an entrepreneur.
- Describe ways of preparing for apprenticeship & Jobs appropriately.

Duration: 24:00	Duration: 36:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain constitutional values, civic rights, responsibility towards society to become a responsible citizen - Discuss 21st century skills - Explain use of basic English phrases and sentences. - Demonstrate how to communicate in a well-behaved manner - Demonstrate how to work with others - Demonstrate how to operate digital devices - Discuss the significance of Internet and Computer/ Laptops - Discuss the need for identifying business opportunities - Discuss about types of customers. - Discuss on creation of biodata - Discuss about apprenticeship and opportunities related to it.	- List different learning and employability related GOI and private portals and their usage - Show how to practice different environmentally sustainable practices. - Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, etc. - Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone - Demonstrate how to communicate in a well -mannered way with others. - Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette - Utilize virtual collaboration tools to work effectively - Demonstrate how to maintain hygiene and dressing appropriately. - Perform a mock interview
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Computer, UPS, Scanner, Computer Tables, LCD Projector, Computer Chairs, White Board OR Computer Lab	

Module 8: On-the-Job Training
Mapped to HVAC Technician

Mandatory Duration: 150:00	Recommended Duration 00:00
Location: On Site	

Terminal Outcomes

1. Explain the importance of interacting with the client to list the issues and/or requirements.

2. Explain how to plan the daily route based on number of client visits and client locations.

3. Check the warranty status and annual maintenance contract of the system based on the client's information.

4. Analyze the conditions and requirements of the site for the problem identified to arrive at solution.

5. Explain how to Inform the client about the time and cost involved.

6. Collect appropriate tools and equipment for maintenance and service.

7. Explain how to identify issues and troubleshoot low-side components such as air handling unit (AHU), fan and filter.

8. Demonstrate how to repair faulty insulation, if any, in refrigerant lines and water pipes

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	*Specialization*	*Years*	*Specialization*	
Diploma/ ITI/ Certified in relevant CITS Trade	Electrical/ Electronics/ Mechanical	1	HVAC Technician	1	Electronics	

Trainer Certification	
Domain Certification	**Platform Certification**
"HVAC Technician", "ELE/Q3112, v3.0", Minimum accepted score is 80%	Recommended that the Trainer is certified for the **HVAC Technician** "Trainer (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2601, V2.0", with minimum score of 80%

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	*Specialization*	*Years*	*Specialization*	
Diploma/ ITI/ Certified in relevant CITS Trade	Electrical/ Electronics/ Mechanical	2	HVAC Technician	1	Electronics	

Assessor Certification	
Domain Certification	**Platform Certification**
"HVAC Technician", "ELE/Q3112, v3.0", Minimum accepted score is 80%	Recommended that the Assessor is certified for the **HVAC Technician** "Assessor (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2701, V2.0", with minimum score of 80%

Assessment Strategy

1. Assessment System Overview:
   - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
   - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
   - The assessment agency deploys the ToA certified Assessor for executing the assessment
   - SSC monitors the assessment process & records

2. Testing Environment

   To ensure a conducive environment for conducting a test, the trainer will:
   - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
   - Check the duration of the training.
   - Check the Assessment Start and End time to be 10 a.m. and 5 p.m. respectively
   - Ensure there are 2 Assessors if the batch size is more than 30.
   - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
   - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
   - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
   - Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:
   - Question papers created by the Subject Matter Experts (SME)

- Question papers created by the SME verified by the other subject Matter Experts
- Questions are mapped with NOS and PC
- Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
- The assessor must be ToA certified and the trainer must be ToT Certified
- The assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:
- Time-stamped & geotagged reporting of the assessor from assessment location
- Centre photographs with signboards and scheme-specific branding
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:

To verify the details submitted by the training centre, the assessor will undertake:
- A surprise visit to the assessment location
- A random audit of the batch
- A random audit of any candidate

6. Method for assessment documentation, archiving, and access

To protect the assessment papers and information, the assessor will ensure:
- Hard copies of the documents are stored
- Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored on the Hard drive

References

Glossary

Term	Description
Declarative knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do **upon the completion of the training**.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do **upon the completion of a module.** A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
ISO	International Organization for Standardization
NCO	National Occupational Standards
NOS	National Skills Qualification Committee
NSQF	National Skills Qualification Framework
OJT	On-the-Job Training
OMR	Optical Mark Recognition
PC	Performance Criteria
PwD	Persons with Disabilities
QP	Qualification Pack
SDMS	Skill Development & Management System
SIP	Skill India Portal
SME	Small and Medium Enterprises
SOP	Standard Operating Procedure
SSC	Sector Skill Council
TC	Trainer Certificate
ToA	Training of Assessors
ToT	Training of Trainers
TP	Training Provider