







## **Model Curriculum**

NOS Name: Essentials of Refrigeration and Air Conditioning

NOS Code: ELE/MCr-0001

NOS Version: 1.0

NSQF Level: 3

**Model Curriculum Version: 1.0** 

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







## **Table of Contents**

Training Parameters	3
Program Overview	4
Training Outcomes	4
Compulsory Modules	4
Module Details	
Woodie 1. Instanation, enarging, servicing, and waintenance	of Low GWT MAC
Annexure	7
Trainer Requirements	7
Assessor Requirements	8
Assessment Strategy	9
References	11
Glossary	11
Acronyms and Abbreviations	12







# **Training Parameters**

Sector	Electronics
Sub-Sector	Consumer Electronics & IT Hardware
Occupation	After Sales Service
Country	India
NSQF Level	3
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7421.0401
Minimum Educational Qualification and Experience	10th grade pass (with 1.5 years relevant experience) OR 8th grade pass (with 3 years relevant experience) OR NSQF Level 2.5 (with 3 years relevant experience)
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18
Last Reviewed On	07/08/2024
Next Review Date	07/08/2027
NSQC Approval Date	07/08/2024
NOS Version	1.0
Model Curriculum Creation Date	07/08/2024
Model Curriculum Valid Up to Date	07/08/2027
Model Curriculum Version	1.0
Maximum Duration of the Course	15 Hrs.







## **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:

#### **Compulsory:**

• Basic lecture introduces different aspects of Electronics and exposure to the current activities at a particular.

#### **Compulsory Modules:**

The table lists the modules and their duration corresponding to the Compulsory Modules of the MCr.

NOS and Module Details	Theory / Demonstration Duration (In Hours)	Practical/OJ T Duration (In Hours)	On-the-Job Training Duration (in hours) (Mandatory)	On-the-Job Training Duration (in hours) (Recommended)	Total Duration (In Hours)
ELE/MCr-0001 : Essentials of Refrigeration and Air Conditioning	07:00	08:00	00:00	00:00	15:00
Module 1: Installation, charging, Servicing, and Maintenance of Low GWP RAC	07:00	08:00	00:00	00:00	15:00
Total Duration	07:00	08:00	00:00	00:00	15:00







### **Module Details**

**Module 1:** Installation, charging, Servicing, and Maintenance of Low GWP RAC Mapped to ELE/MCr-0001: Essentials of Refrigeration and Air Conditioning

#### **Terminal Outcomes:**

Upon completion of the module on Installation, charging, Servicing, and Maintenance of Low GWP RAC, students will be able to:

- Proficiently install, service, and maintain refrigeration and air conditioning systems to industry standards.
- Demonstrate comprehensive understanding and application of environmental regulations and safety protocols in refrigerant handling.
- Efficiently diagnose and resolve complex technical issues related to RAC systems, ensuring optimal performance.

#### Duration: 07:00 hrs

#### **Theory - Key Learning Outcomes**

- Understand environmental regulations: Montreal Protocol, Kigali Amendment, and their impact on refrigerants.
- Explain the vapor compression cycle, heat transfer principles, and air-conditioning system components.
- Identify properties and classifications of refrigerants like HFC-32, and low-GWP alternatives.
- Apply safety protocols for handling flammable refrigerants, ensuring workplace safety and compliance.
- Describe energy efficiency practices and their importance in RAC systems.
- Explain the technician certification process, roles of HPMP, and international standards for certification.

#### Duration: 08:00 hrs

#### **Practical - Key Learning Outcomes**

- Perform refrigerant recovery, brazing, leak testing, vacuum holding, and routine maintenance effectively.
- Demonstrate installation skills for split air-conditioners, including proper location selection and refrigerant tube connection.
- Conduct comprehensive servicing practices for RAC systems, including cleaning, flushing, and pressure testing.
- Implement safety measures when working with flammable refrigerants, ensuring safe handling and storage.







Communicate professionally with customers and team members, maintaining service quality and customer satisfaction.

#### Classroom Aids: (If Offline mode)

- Whiteboard and Markers
- Chart paper and sketch pens
- LCD Projector and Laptop for presentations

#### **Tools, Equipment and Other Requirements**

Labs equipped with the following:

- Tools: Brazing equipment, refrigerant recovery machine, vacuum pump, manifold gauge set, leak detectors.
- Equipment: Split air-conditioners (IDU and ODU), refrigeration tubing, safety gear for handling refrigerants.







## **Annexure**

## **Trainer Requirements**

	Trainer Prerequisites					
Minimum Educational	Specializatio n	Relevant Industry Experience		Training Experience		Remarks
Qualification		Years	Specialization	Years	Specialization	
Graduate Science & Engineering	Electrical/ Mechanical/ Electronics	0	RAC	1	RAC	
Diploma/ITI	Electrical/ Mechanical/ Electronics	1	RAC	1	RAC	

Trainer Certification		
Domain Certification	Platform Certification	
"Essentials of Refrigeration and Air Conditioning, ELE/MCr-0001 version 1.0". Minimum accepted score is 80%.	Recommended that the Trainer is certified for the <b>Essentials of Refrigeration and Air Conditioning</b> "Trainer (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2601, V2.0", with minimum score of 80%	







## **Assessor Requirements**

	Assessor Prerequisites					
Minimum Educational	Specializatio n	Relevant Industry Experience		Training Experience		Remarks
Qualification		Years	Specialization	Years	Specialization	
Graduate Science & Engineering	Electrical/ Mechanical/ Electronics	1	RAC	1	RAC	
Diploma/ITI	Electrical/ Mechanical/ Electronics	2	RAC	1	RAC	

Assessor Certification				
Domain Certification	Platform Certification			
"Essentials of Refrigeration and Air Conditioning, ELE/MCr-0001, version 1.0". Minimum accepted score is 80%.	Recommended that the Assessor is certified forthe Essentials of Refrigeration and Air Conditioning "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
- Assessment agency deploys the ToA certified Assessor for executing the assessment
- · SSC monitors the assessment process & records

#### 2. Testing Environment:

- 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 as 10 a.m. and 5 p.m.
- · If the batch size is more than 30, then there should be 2 Assessors.
- · 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
- · Assessor must be ToA certified & trainer must be ToT Certified
- 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:
  - · Surprise visit to the assessment location
  - · Random audit of the batch
  - · Random audit of any candidate
- 6. Method for assessment documentation, archiving, and access
  - · 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 in the Hard Drives







### **References**

## Glossary

Term	Description
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do 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/OJT application).
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of the training</b>
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do <b>upon the completion of a module</b> . A set of terminal outcomes help to achieve the training outcome.
National Occupational Standard	National Occupational Standard specify the standard of performance an individual must achieve when carrying out a function in the workplace
Persons with Disability	Persons with Disability are those who have long-term physical, mental, intellectual, or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others







## **Acronyms and Abbreviations**

Term	Description
QF	Qualification File
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
SSC	Skill Sectors Councils
NASSCOM	National Association of Software & Service Companies
NCO	National Classification of Occupations
ISO	International Organization for Standardization
SLA	Service Level Agreement
IT	Information Technology
CRM	Customer Relationship Management
PC	Performance Criteria
PwD	Persons with Disability
SOP	Standard Operating Procedure