**Certificate course in Room Air Conditioner & Refrigerator Maintenance**

* Course ID **: MSME/ACREF/001**
* Candidate Eligibility **: Pass Class 8th**
* No. of NOS (if QP) : UNDER PROCESS
* NSQF Level : **3**
* Cost Category : **1**
* Course Duration **:**
* **Technical Training at CTTC (Theory & Practical): 270 Hrs.**

**Trainer Qualification and Work Experience:**

**Trainer Qualification: Degree in Mechanical Engineering.**

**CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE**

**Name and address of submitting body:**

**MSME TOOL ROOM – KOLKATA**

**(Central Tool Room & Training Centre)**

**Ministry of MSME , Govt. of India**

**Bonhooghly Industrial Area**

**Kolkata – 700108 , West Bengal**

**Ph: (033)25788769,25771068**

**Name and contact details of individual dealing with the submission**

**Name: Shri Kanakendu Das**

**Position in the organisation: Senior Manager-Trg**.

**Tel number(s): 9231897100**

**E-mail address:** [**cttc@cal.vsnl.net.in**](mailto:cttc@cal.vsnl.net.in) **/ cttc-msme@gov.in**

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| **Qualification Title :** | **Certificate course in Room Air Conditioner & Refrigerator Maintenance** |
| **Qualification Code** | **MSME/ACREF/001** |
| **Nature and purpose of the :**  **Qualification** | Nature of the course is trade **Certificate Course.**  The purpose of the qualification are   * Learners who attend this qualification are competent to work on Different Types of Room Air-conditioners, Refrigerators, Washing Machines & Microwave Ovens * Qualified learners get employed into work. * People upgrade their skills and knowledge already in work. * People with vocational – professional skill access to the   higher education courses.   * Qualifying learners of this qualification would be able to get opportunity in particular sector to learn new skills to deal with technological change. |
| **Body/bodies which will**  **award the qualification** | MSME TOOL ROOM – KOLKATA (Central Tool Room & Training Centre - Kolkata) |
| **Body which will accredit providers to offer courses**  **leading to the qualification** | MSME TOOL ROOM – KOLKATA (Central Tool Room & Training Centre – Kolkata) |
| **Body/bodies which will**  **carry out assessment of**  **learners** | Examination Cell of MSME TOOL ROOM - KOLKATA |
| **Occupation(s) to which the qualification gives access** | Asst. Engineer / Service & Demonstration Engineer / Skilled worker in Room AC & Refrigerator/ Entrepreneur. |
| **Licensing requirements** | NA |
| **Level of the qualification in**  **the NSQF** | **3** |
| **Anticipated volume of**  **training/learning required to complete the qualification** | **2 Months /60 DAYS.**   |  |  |  | | --- | --- | --- | | Sr. No | Course Elements (Subject) | Daily Distribution | | Module-1  Module-2  Module-3 | - Air-Conditioner Technical Class  - Refrigerator Technical Class  -- Soft skills development & Empathy Classes | 120 Hrs.  120 Hrs.  30 Hrs. | |  | Total | 270 Hrs. | |
| **Entry requirements and/or**  **recommendations** | **Passed 8thclass / 10thclass / 12thclass / ITI / Diploma in any trade / Graduate.**  **Minimum Age: 18years old** |
| **Progression from the**  **qualification** | Qualifying trainee should obtain a MSME Approved certificate in “Certificate course in Room Air Conditioner & Refrigerator Maintenance” trade issued by MSME Tool Room Kolkata. This qualification shall enable the trainee to find employment on a skilled work in the fields of repairing & servicing of Air-conditioners & Other Home Appliances Industries.  Having Scope to access to other qualification at the same level and at the next higher level.  After completion of course the trainee can work as a Junior Engineer / Engineer / Senior Engineer /After 2 to 3 years of experience in service centres, the person can develop his own service centre as an entrepreneur. |

**SYLLABUS :**

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| **Days** | **Topics** | **Theory / Practical** | **Components** |
| Day-1 | What is Refrigeration ? | T | AC  120 Hrs. |
| Vapor Compression Cycle | T/P |
| About Refrigerant | T |
| Day 2 | Air-conditioning Systems | T/P |
| Types of Air-conditioners | T |
| Day 3 | About Heat Load | T |
| Day 4 | Psychrometric | T |
| Day 5 | Air-conditioner parts | T/P |
| Types of compressor | T/P |
| Heat exchangers | T/P |
| Fan Blower and motor | T |
| Day 6 | Expansion Devices | T |
| Part of Air conditioner | T/P |
| Accumulator | T/P |
| Reversible valve- cooling /Heating | T |
| Day 7 | Basic Electricity | T/P |
| Day 8 | Product Prevention- Introductio | T/P |
| Product Prevention- Safety | T/P |
| PL case by wrong installation | T/P |
| Day 9 | Required tools & Accessoris | T/P |
| Installation instruction | T/P |
| Installation method | T/P |

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| **Days** | **Topics** | **Theory / Practical** | **Components** |
| Day 10 | Practical training content | T/P | AC  120 Hrs. |
| Installation Work | T/P |
| Place Selection ( Indoor & Out door ) | T/P |
| Performance | T |
| Day11 | Pipe cutting, flaring bending, Layout | T/P |
| Day 12 | Drilling Hole and piping exercise | T/P |
| Day 13 | Vaccuming | T/P |
| Gas Charging Method | T/P |
| Day 14 | Features And Demo | T/P |
| Day15 | Compressor Check | T/P |
| Symptoms | T/P |
| Day 16 | Steps to replace compressor | T/P |
| Day 17 | Checking of PCB | T/P |
| Remocon Features | T/P |
| Day 18 | BEE Sticker Specification | T/P |
| Stablizer Free Operation | T |
| Model Nomenclature | T |
| Preventive Maintainence | T/P |
| Cleaning AC | T/P |
| Day 19~20 | FAQ's | T |

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| **Chapter** | **Topic** | **Description** | **Components** | **For Students** |
| 1 | About MSME | MSME overview, Values and Philosophy | **Soft Skills Class** | 30 Hrs. |  |
| 2 | Basics of Electricals and electronics | About : Electricity, Electronics, Voltage, Current, Ohm's Law, Series Circuit, Parallel Circuit, Basic Components. |
| Behavior Soft skills | What are behavior & soft skills? |
| Standard Tools | Home Appliances Standard Repair and Installation Tools Kit |
| HA Product Portfolio | Home Appliances Product Range |
| 3 | Technology overview | What is Refrigerator? , Advantages of Refrigerator; Types of Refrigerators, Difference between Direct Cool and Frost Free Refrigerator. What is Refrigeration?, Steps of Refrigeration Cycle, , Sealed System Parts Working Process, What is Refrigerant? , Types of Refrigerants. | **REFRIGERATOR** | 120 Hrs. |
| Operating Instructions | Key Features , Correct Installation Place, Installation Process, How to use  No Defect Found Solutions , Do's and Don'ts / Safety Precautions |
| 4 | Technical Education | Parts Working and Checking process Parts Assembling and Disassembling Process |
| Troubleshoot | Wiring Diagram Technical Fault |
| 5 | Technical Education | Parts Working and Checking process Parts Assembling and Disassembling Process |
| Troubleshoot | Wiring Diagram Technical Fault |
| 6 | Technical Education | Parts Working and Checking process Parts Assembling and Disassembling Process |
| Troubleshoot | Wiring Diagram Technical Fault |
| 7 | Technical Education | Parts Working and Checking process Parts Assembling and Disassembling Process |
| Troubleshoot | Wiring Diagram Technical Fault |
| 8 | Advanced Technology | Demerits of Conventional Compressor Merits of Inverter Compressor |
| Technical Education | Parts Working and Checking process Parts Assembling and Disassembling Process |
| Troubleshoot | Wiring Diagram Technical Fault |
| 9 | Sealed System repair | Mandatory Parts and Equipments, Symptoms, Refrigerant Discharge Process, Compressor Disassembling Process Nitrogen Flushing Process, Parts Assembling Process, Leakage Testing, Vacuuming, R600a Safe Gas Charging Process, Final Inspection |  |  |

**Minimum pass mark (COMPETENT): 55% for each theory subject and 55% for practical;**

**Fail candidates are entitled to one more chance to clear the paper.**

**RESULTS AND CERTIFICATION:** Successful trainees will be awarded the Certificates by

**MSME TECHNOLOGY CENTRE**.

**ASSESSMENT EVIDENCE:** Assessment evidence comprises the following components document in the form of records:

* Examination - Answer sheet of assessment
* Viva –voce ; Class test
* Progress chart ; Attendance and punctuality
* Assignment of practical exercise job ; Practical Exam for each module

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| **Evaluation Criteria for MSME Students Certification for**  **Certificate course in Room Air Conditioner & Refrigerator Maintenance Course** | | | | |
| Date Prepared: 15-Nov-15, Date Updated: 06-Jan-17 | | | | |
| **Sr. No.** | |  | | --- | | **Evaluation Topic** | | **Method** | **Sub evaluation criteria** | **Marks** |
| 1 | Theoretical | Written test | **Final certification test** | 20 |
| **Product-Module wise test** | 10 |
| 2 | Practical | Practical test | **Product-Module wise Practical test** | 50 |
| 3 | Behavioral | Attendance tracking | **Attendance** | 10 |
| Instructor Observation | **Discipline** | 5 |
| Samsung uniforms |
| Participation in class activities |
| personal hygiene |
| **Communication Skills** | 5 |
| Speaking skills |
| Listening skills |
| courteous communication |
| Interaction with others |
|  | Total | | | 100 |

**Title of Component: “Certificate course in Room Air Conditioner & Refrigerator Maintenance”**

**Assessable outcomes:**

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| **Means of assessment :**  Assessment comprises the following components:   * Answer sheet of assessment * Written Class Test * Viva-voce * Attendance and punctuality * Practical Exam for each module |
| **Pass (Competent)/Fail (Not yet Competent): 50% for each Theory subject and 50% for Practical.**  **Fail candidates (not yet competent) are entitled to one more chance to clear the paper in order to be competent.** |