**CERTIFICATE COURSE IN ROOM AC & HOME APPLAINCES**

* Course ID **: MSME/RACHA/001**
* Candidate Eligibility **: Pass Class 10th**
* No. of NOS (if QP) : UNDER PROCESS
* NSQF Level : **3**
* Cost Category : **1**
* Course Duration **:**
* Theory duration **: 150 Hrs.**
* Practical + OJT **: 438 Hrs.**
* **TOTAL : 588 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 AC & HOME APPLAINCES** |
| **Qualification Code** | **MSME/RACHA/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. Service Engineer / Service Engineer / Skilled worker in Room AC & Home Appliances sectors. |
| **Licensing requirements** | NA |
| **Level of the qualification in**  **the NSQF** | **??** |
| **Anticipated volume of**  **training/learning required to complete the qualification** | **4 Months / 588 Hrs.**   |  |  |  | | --- | --- | --- | | Sr. No | Course Elements (Subject) | Daily Distribution | | Basics | - Basic Mechanical, Electrical & Electronics Class | 150 Hrs. | | Module-1  Module-2  Module-3  Module-4  Module-5  Module-6 | - Air-Conditioner Technical Class  - Refrigerator Technical Class  - Washing Machine Technical Class  - Microwave Oven Technical Class  -- Soft skills development & Empathy Classes  On Job Training in Service Centre | 96 Hrs.  90 Hrs.  60 Hrs.  36 Hrs..  12 Hrs.  144 Hrs. | |  | Total | 588 Hrs. | |
| **Entry requirements and/or**  **recommendations** | **Passed 12thclass / ITI / Diploma in any trade.**  **Minimum Age: No age limit** |
| **Progression from the**  **qualification** | Qualifying trainee should obtain a MSME Approved certificate in RACHA 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. |

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| **Chapter** | **Module** | **Topic** | **Description** | **Page No.** | | **Training Type** | | **Days** | |
| 1 | Introduction | About  Samsung | Company overview, Philosophy & Product portfolio.  Reporting Structure & Individual’s role | 7 - 17 | | T / AV | | Day 1 | |
| 2 | Basic Terminology | Basics of Electricals and Electronics | **Electrical and Electronics** :Introduction to electricity,  Electric current, emf, resistance; Power; Ohms law.  Types of circuits- series, parallel, open & closed.  Basic Components. | 18 - 24 | | T | |
|  | Basics of Heat | **Heat** : What is heat; Heat transfer-conduction, convection,  radiation; Forms of heat; Heat load. | | 25 - 28 | T |  | |
| 3.1 | AC - Basics |  | **Psychometrics**: What is psychometric; Dry bulb, Wet bulb,  Relative humidity. | 29 – 30 | | T | | Day 2  Day 3 | |
|  | Technology  overview | Refrigeration & air-conditioning, Vapour compression cycle.  About refrigerants, Types of refrigerant, Refrigerant regulation, R410a overview | | 31 - 38 | T / A |  | |
| Product  overview | Types of air-conditioners - WAC, SAC, Ducted, Package, Chiller, DVM functioning. | | 39 - 42 | T |
| **Test – 1 (Module 1 ~ 3.1)** | | | | | | | | **Day 3** | |

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| 3.2 | AC - Basics | Parts  overview | Types of compressor and their operating principles –  Reciprocating, Rotary, Scroll, Screw. | 43 - 47 | | T / A | | Day 4 |
| Types of heat exchangers and their functioning, Fin and tube, PFC, shell and tube, plate type; Problems in heat exchanger. | | 48 - 49 | | T |  |
| Types of fan and blowers - propeller, centrifugal, cross flow. | | 50 | | T | Day 5 |
| Expansion Devices - Capillary, TEV, EEV | | 51 | | T |
| Accessories- Accumulator, Oil separator, Receiver, Mufflers, Thermostat, 4-Way reversing valve, Heat Pump Cycle | | 52 - 54 | | T / A | Day 6 |
| Types and functioning of motors - AC / DC motors | | 55 | | T |
| Advanced  technology | Overview of inverter Air-conditioner, Inverter technology and functioning. | | 56 - 57 | | T | Day 7 |
| **Test – 2 (Module 3.2)** | | | | | | | | **Day 7** |
| 4 | AC – Tools & Safety | Tools | Basic tools identification - Tube cutter, Drilling machine, Flaring tool, Tube benders etc. | 58 - 60 | | T / AV / P | | Day 8 |
| Safety & PL | General safety guidelines, Product Prevention - Introduction, PL case by wrong installation | | 61 - 75 | | T |  |

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| **Chapter** | **Module** | **Topic** | **Description** | **Page No.** | **Training Type** | **Days** |
| 5 | AC – Installation | Installation  Process | Installation instruction, Correct Installation method, Place  Selection (Indoor & Outdoor)  Pre Installation Requisites & Post Installation checkpoints | 76 - 102 | T / AV | Day 9 |
| Pipe Preparedness | Pipe cutting, Flaring, Bending, Swaging, Tube brazing practice | 103 - 104 | AV / P | Day 10 |
| Installation  Practice | Core Drilling exercise, Tube insulation, wiring and piping  layout, Vacuuming, Gas Charging Method,  Complete Installation |
| Day 11  Day 12 |
| Demo &  Installation | Remote control features and demo with Role Play  Cassette Unit Installation, Installation – Do’s & Don’ts | 105 - 126 | T / P | Day 13 |
| **Test – 3 (Module 4 ~ 5)** | | | | | | **Day 13** |
| 6 | AC - Trouble Shooting | Technical  repair | Compressor trouble shooting, Symptoms of failure, How to check failed Compressor, Steps to replace compressor | 127 - 130 | T / P | Day 14 |
| Electrical trouble shooting, How to diagnose electrical parts failure, Checking of PCB. | 131 - 138 | T / P | Day 15 |
| Symptom based troubleshooting : No Cooling Repair, No Power Repair, Noise Repair, Water leakage Repair  Disassembly & Assembly – Indoor & Outdoor Unit | 139 - 146 | T / P | Day 16  Day 17 |
| Star rating &  preventive  maintenance | Overview of Star labeling (BEE) & E-Waste Concept | 147 - 149 | T |
| Safety Precautions, Preventive Maintenance & Cleaning of AC, Important Tips, Checkpoints, Optional Skills | 150 - 165 | T |
| **Test – 4 (Module 6)** | | | | | | **Day 17** |

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| **Chapter** | **Module** | **Topic** | **Description** | **Page No** | **Training Type** | **Days** | |
| 7 | Refrigerator Basics | HA Range and Tools | Home Appliances Product Range,  Repair and Installation Tools Kit & Safety Precautions | 166 - 175 | T / P | Day 18 | |
| Technology Overview | What is Refrigerator ? Advantages of Refrigerator; Types of Refrigerators, Difference between Direct Cool & Frost Free Refrigerator, What is Refrigeration? Steps of Refrigeration Cycle, Sealed System parts working process, What is refrigerant & types of refrigerants. | 176 – 182 | T | |  | |
| Operating Instructions | Key Features, Correct Installation Place, Installation Process, How to use?, No Defect Found Solutions, Do's and Don'ts / Safety Precautions , Check Points | 183- 212 | T / AV / P | | Day 19 | |
| **Test – 5 (Module 7)** | | | | | | **Day 19** | |
| 8 | Direct Cool Refrigerator | Technical Education and  Troubleshoot | Parts Working and Checking process  Parts Assembly & Disassembly Process  Wiring Diagram, Technical Fault | 213 – 225 | T / P | Day 20  Day 21 | |
| 9 | Mechanical Frost Free Refrigerator | Technical Education and  Troubleshoot | Parts Working and Checking process  Parts Assembly & Disassembly Process  Wiring Diagram, Technical Fault | 226 – 235 | T / P | Day 22 | |
| 10 | Semi Electronics Frost Free Refrigerator | Technical Education and  Troubleshoot | Parts Working and Checking process  Parts Assembly & Disassembly Process  Wiring Diagram, Technical Fault | 236 - 240 | T / P | Day 23  Day 24 | |

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| 11 | Electronics Frost Free Refrigerator | Technical Education and  Troubleshoot | Parts Working and Checking process  Parts Assembly & Disassembly Process  Wiring Diagram, Technical Fault | 241 – 246 | T / P | Day 25  Day 26 |
| **Test – 6 (Module 8 ~ 11)** | | | | | | **Day 26** |
| 12 | Inverter Refrigerator | Technical Education and  Troubleshoot | Demerits of Conventional Compressor  Merits of Inverter Compressor  Parts Working and Checking process  Parts Assembly & Disassembly Process  Wiring Diagram, Technical Fault, Check Points | 247 – 268 | T / P | Day 27  Day 28  Day 29 |
| 13 | Refrigerator Sealed System | Sealed System Repair | Mandatory Parts & Equipments, Symptoms, Refrigerant Discharge Process, Compressor disassembling, Nitrogen Flushing , Parts Assembling, Leakage Testing, Vacuuming, R600a Safe Gas Charging Process, Final Inspection | 269 - 276 | T / AV / P | Day 30  Day 31 |
| **Test – 7 (Module 12 ~ 13)** | | | | | | **Day 31** |
| 14 | Washing Machine Basics | Technology Overview | What is Washing Machine & its advantages.  Types of Washing machine, Difference between Semi  Automatic & Fully Automatic Washing Machine,  Washing Principle | 277- 280 | T | Day 32  Day 33 |
| Operating Instructions | Key Features, Correct Installation Place, Installation Process, How to use, No Defect Found Solutions,  Do's and Don'ts / Safety Precautions , Check points | 281 - 311 | T / AV / P |  |

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| **Chapter** | **Module** | **Topic** | **Description** | | **Page No.** | **Training Type** | **Days** | |
| 15 | Semi Automatic Washing Machine | Technical Education and  Troubleshoot | Parts Working and Checking process  Parts Assembly & Disassembly Process  Wiring Diagram, Technical Fault | | 312 – 321 | T / P | Day 34  Day 35  Day 36 | |
| 16 | Fully Automatic Washing Machine | Technical Education and  Troubleshoot | Parts Working and Checking process  Parts Assembly & Disassembly Process  Wiring Diagram, Technical Fault, Check Points | | 322 - 348 | T / P | Day 37  Day 38  Day 39 | |
| **Test – 8 (Module 14 ~ 16)** | | | | | | | **Day 39** | |
| 17 | Microwave Oven Basics | Technology Overview | | What is Microwave Oven, Advantages, Types of Microwave Oven, Difference between Solo, Grill and Convection Oven Working Principle | 349- 351 | T | Day 40 | |
| Operating Instructions | | Key Features, Correct Installation Place, Installation  Precautions, How to use, No Defect Found Solutions ,  Do's and Don'ts / Safety Precautions | 352- 358 | T / AV / P | | Day 41 |
| 18 | Convection Microwave Oven | Technical Education  Troubleshoot | | Parts Working and Checking process  Assembly & Disassembly, Wiring Diagram, Technical Fault | 359 – 372 | T / P | Day 42  Day 43 | |
| 19 | Skills | Optional  Skills | | Skills required for Installation and Repair Engineer,  How to operate Computers and software.  Checkpoints – Engage with customer, Interact with colleagues, To be learn during OJT | 373 - 382 | T | Day 44  Day 45 | |
| **Test – 9 (Module 17 ~ 19)** | | | | | | | **Day 45** | |
| **FINAL THEORY TEST (2 Hr)** | | | | | | | **Day 46 Day 47** | |
| **FINAL PRACTICAL TEST** | | | | | | |

**Minimum pass mark (COMPETENT): 70% for each theory subject and 70% 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 AC & HOME APPLAINCES 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 |

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| **Overall Grade**  **1:Master- >95 ; 2:Expert- 81-95 ; 3:Senior- 71-80 ; 4: Fail<70** | | | | | | | | | | |
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| **Grade wise Distribution of MSME Samsung Technical School Trainees, Kolkata** | | | | | | | | | | |
| Date Prepared: 15-Nov-15, Date Updated: 06-Jan-17 | | | | | | | | | | |
| Course | Total Students | **Trainees Grade Split Up** | | | | | | | | **Remarks** |
| **1- Master** | | **2- Expert** | | **3- Senior** | | **4- Fail** | |
| Numbers | %age | Numbers | %age | Numbers | %age | Numbers | %age |
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| Total |  |  |  |  |  |  |  |  |  |  |

**Title of Component: “CERTIFICATE COURSE IN ROOM AC & HOME APPLAINCES”**

**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): 70% for each Theory subject and 70% for Practical.**  **Fail candidates (not yet competent) are entitled to one more chance to clear the paper for Basic Module only in order to be competent.** |

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