



Model Curriculum

QP Name: Electronics Manufacturing Services (EMS) Technician

QP Code: ELE/Q5315

QP Version: 4.0

NSQF Level: 4

Model Curriculum Version: 4.0

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

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Training Parameters

Sector	Electronics
Sub-Sector	Electronics Manufacturing System
Occupation	Assembly and Soldering
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3114.9900
Minimum Educational Qualification and Experience	12th grade or equivalent Or 10th grade or equivalent with 3 years relevant experience Or Certificate-NSQF (Level-3 in relevant domain) with 3 years of relevant experience # Relevant Experience in Electronics Manufacturing Services
Pre-Requisite License or Training	NA
Minimum Job Entry Age	NA
Last Reviewed On	07/10/2025
Next Review Date	07/10/2028
NSQC Approval Date	07/10/2025
QP Version	4.0
Model Curriculum Creation Date	07/10/2025
Model Curriculum Valid Up to Date	07/10/2028
Model Curriculum Version	4.0
Minimum Duration of the Course	450 Hours
Maximum Duration of the Course	450 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:

- Demonstrate the process of operating reflow-oven soldering machine
- Demonstrate the process of applying solder paste.
- Demonstrate the process of operating pick-and-place machine for PCB assembly.
- 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
ELE/N5304: Operate reflow-oven soldering machine	30:00	60:00	00:00	30:00	120:00
Module 1: Process of operating reflow-oven soldering machine	30:00	60:00	00:00	30:00	120:00
ELE/N5201: Apply solder paste	30:00	60:00	00:00	30:00	120:00
Module 2: Process of applying solder paste	30:00	60:00	00:00	30:00	120:00
ELE/N5104: Operate pick-and-place machine for PCB assembly	60:00	60:00	00:00	60:00	180:00
Module 3: Process of operating pick-and-place machine for PCB assembly	60:00	60:00	00:00	60:00	180:00
DGT/VSQ/N0101 – Employability Skills (30 Hours)	30:00	00:00	00:00	00:00	30:00
Module 4: Employability Skills (30 Hours)	30:00	00:00	00:00	00:00	30:00
Total Duration	150:00	180:00	00:00	120:00	450:00

Module Details

Module 1: Process of operating reflow-oven soldering machine

Mapped to ELE/N5304

Terminal Outcomes:

- Introduction to the roles and responsibilities of Electronics Manufacturing Services (EMS) Technician.
- Demonstrate the process of programming and operating the reflow- oven machine.
- Demonstrate the process of performing quality inspection.
- Demonstrate the process of performing preventive maintenance of the machine.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
● Describe the roles and responsibilities of Electronics Manufacturing Services (EMS) Technician. ● Inspect Printed Circuit Board (PCB) loading list ● Inspect assembled boards for any defects before loading ● Examine the soldering process until boards come out of the machine after soldering ● Inspect the soldered boards to ensure quality ● Ensure that components are soldered using programmable reflow ovens with real-time thermal profiling for precise soldering ● Manage the reflow oven machine as per the prescribed standards to avoid any downtime ● Apply regular cleaning techniques on the machine as prescribed by the machine manufacturer ● Follow the Electro Static Discharge (ESD) precaution guidelines and contamination prevention handling practices ● Inspect the components to ensure that they are damage free and in proper working condition ● Follow the quality standards for PCB soldering	● Apply specified program for a specific type of PCB assembly ● Operate at specified temperature and time profile of heaters and coolers ● Fine-tune the conveyer according to the size of PCB ● Load boards and start the oven for the soldering schedule ● Prepare board as per expected timelines for the next process ● Adjust temperature and time of the machine as per prescribed standard of the PCB ● Maintain the solder as per Restriction of Hazardous Substances Directive (RoHS) compliance

Classroom Aids

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

Tools, Equipment and Other Requirements

SMT machines, circuit boards, soldering equipment, feeders, carriages, stencil printer, soldering unit, stencils, epoxy and soft solder bonders, high precision flip chip bonders, stacked die bonders, trim & form, package mould, simulation and plating systems, automatic wire bonders, multi-axis welding, manual wire bonders, table top wire bonders, solder reflow systems Reflow Oven, ESD Mats, ESD gloves, ESD wrist strap, AOI

Machine, PCB Boards, Solder Iron.

Module 2: Process of applying solder paste

Mapped to ELE/N5201

Terminal Outcomes:

- Demonstrate the process of performing pre-screen printing activities.
- Demonstrate the process of applying solder paste.
- Demonstrate the process of performing preventive maintenance of the machine.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Identify the correct stencil to print the PCB. • Procure the prescribed stencil from the store. • Inspect the PCBs using a roller and microscope to ensure that they are free from dust particles • Inspect the stencil and other components regularly • Ensure that PCBs are stable and do not move • Refine the boards to provide the required PCB finish as per the standards • Authenticate stencil printer alignment for controlled application of solder paste such as paste print speed, print pressure, separation speed and distance • Inspect the components to ensure that there is no leakage through stencil holes • Inspect the paste to ensure that all parts are printed evenly • Apply regular cleaning techniques on the machine and its components as prescribed by the machine manufacturer • Follow the procedure of preventive maintenance • Schedule board within the defined timelines for the next process	• Amend the sheet in the roller after every 10 boards • Construct the apertures using a laser cut so as to design the PCB as per the standards to ensure that it is not hand-touched • Set up the printing machine and program it based on the appliance flow chart • Compute the specified programs on the machine's computer • Apply paste using an automated application process while ensuring that an optimized program overlay is used as a precision fixture • Use framed stencil for machine application and prototype stencil for hand application of solder paste • Synchronize the stencil and board for printing machine of PCB • Compute specified programs in the machine's computer according to the PCB assembly plan

● Follow work standards as defined by the organization. ● Inspect accuracy of printed solder paste ● Formulate the coordinates as per customer specified design chart or as per the design of the board ● Identify components for accurate placement on the reel ● Apply the troubleshooting process, if required for accurate placement of the components	
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
SMT machines, circuit boards, and soldering equipment, feeders, carriages, stencil printer, soldering unit, Stencils, epoxy and soft solder bonders, high precision flip chip bonders, stacked die bonders, trim & form, package mould, simulation and plating systems, Automatic Wire Bonders, Multi-Axis Welding, Manual Wire Bonders, table top wire bonders, Solder Reflow Systems	

Module 3: Process of operating pick-and-place machine for PCB assembly

Mapped to ELE/N5104

Terminal Outcomes:

- Demonstrate the process of programming and loading the pick-and-place machine.
- Demonstrate the process of performing assembling on PCBs.
- Describe the process of visually inspecting after assembly cycle.
- Demonstrate the process of performance preventive maintenance of the machine.

Duration: 60:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
● Fine-tune PCB transport rails for all machines ● Verify the loaded value on programme and wheel as per the specification ● Verify the spacing between the components ● Follow norms as per ESD and contamination prevention handling practices ● Follow the compliances for pick and place and soldering ● Inspect the PCB and components received from screen printing section prior to assembly ● Assess the components to ensure that solder paste is spread appropriately as per specifications before starting the pick-and-place operation	● Check all components and feeder according to the selected program ● Set up the components to operate the machine in prescribed time period ● Provide the finished PCB boards to the Reflow Machine Operator ● Refill the components as and when the reel or tray gets empty
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Desktop computer, my data SMT machines, circuit boards, soldering equipment, feeders, carriages, stencil printer, soldering unit, stencils, epoxy and soft solder bonders, high precision flip chip bonders, stacked die bonders, trim & form, package mould, simulation and plating systems, automatic wire bonders, multi-axis welding, manual wire bonders, table top wire bonders, solder reflow systems	

Module 4: Employability Skills (30 Hours)

Mapped to DGT/VSQ/N0101

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: 30:00	Duration: 00:00
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.	
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 5: On-the-Job Training

Mapped to Electronics Manufacturing Services (EMS) Technician

Mandatory Duration: 120:00	Recommended Duration: 00:00
Location: On Site	
Terminal Outcomes 1. Check the daily PCB loading list. 2. Set temperature and time profile of heaters and coolers. 3. Examine soldered boards to ensure quality. 4. Check placement and solder of components. 5. Perform regular cleaning as prescribed by machine manufacturer. 6. Collate the right stencil from stores and verify the correct screens and design to print. 7. Change the sheet in the roller for every 10 boards. 8. Set up printing machine and program it based on the performance flow chart. 9. Attach the stencil and board to printing machine. 10. Confirm even release of paste with electro polished finish. 11. Install specified programs on machine's computer according to PCB assembly plan. 12. Perform troubleshoot and optimisze the program. 13. Check and update the daily PCB-loading list	

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	Electronics/ Mechanical	1	EMS Technician	1 year preferably	Electronics	

Trainer Certification	
Domain Certification	Platform Certification
“Electronics Manufacturing Services (EMS) Technician”, “ELE/Q5315, v4.0”, Minimum accepted score is 80%	Recommended that the Trainer is certified for the Electronics Manufacturing Services (EMS) 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	Electronics/ Mechanical	2	EMS Technician	1 year preferably	Electronics	

Assessor Certification	
Domain Certification	Platform Certification
“Electronics Manufacturing Services (EMS) Technician”, “ELE/Q5315, v4.0”, Minimum accepted score is 80%	Recommended that the Assessor is certified for the Electronics Manufacturing Services (EMS) 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