Model Curriculum

QP Name: EMS Technician

QP Code: ELE/Q5315

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	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	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:

- 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
Bridge Module	**06:00**	**04:00**	**00:00**	**00:00**	**10:00**
Module 1: Introduction and orientation to the role of an EMS Technician	06:00	04:00	00:00	00:00	10:00
ELE/N5304: Operate reflow-oven soldering machine	**30:00**	**60:00**	**00:00**	**30:00**	**120:00**
Module 2: 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**	**60:00**	**150:00**
Module 3: Process of applying solder paste	30:00	60:00	00:00	60:00	150:00
ELE/N5102: Operate pick-and-place machine for PCB assembly	**60:00**	**80:00**	**00:00**	**60:00**	**200:00**

Module 4: Process of operating pick-and-place machine for PCB assembly	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 an EMS Technician
Bridge Module

Terminal Outcomes:

- Discuss the job role of an EMS 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 an EMS Technician. - Describe various employment opportunities for an EMS Technician.	- Familiarization with SMT Lines - Awareness of Assembly Components
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
NA	

Module 2: Process of operating reflow-oven soldering machine
Mapped to ELE/N5304

Terminal Outcomes:

- 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**
- 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 - 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 - Manage records of assembly and other procedures such as Rework, Automatic Optical Inspection (AOI) - 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 3: 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 - Follow work standards as defined by	- 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

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 4: Process of operating pick-and-place machine for PCB assembly
Mapped to ELE/N5304

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: 80:00
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 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 workplace.	- 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.

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

Mandatory Duration: 150:00	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**
"EMS Technician", "ELE/Q5315**, v3.0", Minimum accepted score is 80%**	Recommended that the Trainer is certified for the **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**
"EMS Technician", "ELE/Q5315**, v3.0", Minimum accepted score is 80%**	Recommended that the Assessor is certified for the **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