# Model Curriculum

**QP Name: PCB Assembly Technician**

**QP Code: ELE/Q7804**

**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 Services |
| **Occupation** | Manufacturing |
| **Country** | India |
| **NSQF Level** | 4 |
| **Aligned to NCO/ISCO/ISIC Code** | NCO-2015/8212.0400 |
| **Minimum Educational Qualification and Experience** | 12th grade or equivalent<br>OR<br>10th grade or equivalent with 3 years of experience<br>OR<br>Certificate-NSQF (Level-3 in relevant domain) with 3 Years of relevant Experience<br># Relevant experience in Electronics Manufacturing System |
| **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** | 480 Hours |
| **Maximum Duration of the Course** | 480 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 assembling Printed Circuit Board (PCB).
- 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/N5106: PCB Assembly Preparation** | **60:00** | **90:00** | **00:00** | **75:00** | **225:00** |
| Module 1: PCB Assembly Preparation | 60:00 | 90:00 | 00:00 | 75:00 | 225:00 |
| **ELE/N5107: PCB Assembly, Quality Check, and Delivery** | **60:00** | **90:00** | **00:00** | **75:00** | **225:00** |
| Module 2: PCB Assembly, Quality Check, and Delivery | 60:00 | 90:00 | 00:00 | 75:00 | 225:00 |
| **DGT/VSQ/N0101: Employability Skills (30 Hours)** | **30:00** | **00:00** | **00:00** | **00:00** | **30:00** |
| Module 3: Employability Skills (30 Hours) | 30:00 | 00:00 | 00:00 | 00:00 | 30:00 |
| **Total Duration** | **150:00** | **180:00** | **00:00** | **150:00** | **480:00** |

# Module Details

## Module 1: PCB Assembly Preparation

*Mapped to ELE/N5106*

**Terminal Outcomes:**

- Role of a PCB Assembly Technician
- Describe all the prerequisites to printed circuit board assembly.
- Describe the process of assembling PCB.

| Duration: 60:00 | Duration: 90:00 |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • Describe the role of a PCB Assembly Technician and the use of SMT and THT techniques along with tools like pick-and-place machines, soldering systems, and inspection technologies in electronics manufacturing.<br>• Understand the purpose and importance of PCB assembly preparation in the overall manufacturing process.<br>• Identify different types of PCB components (SMD, through-hole) and their orientation and polarity markings.<br>• Explain the interpretation of circuit diagrams, assembly drawings, and Bill of Materials (BOM).<br>• Describe handling, storage, and sorting procedures for electronic components as per industry standards.<br>• Understand ESD safety measures and their significance in component and PCB protection.<br>• Explain the use of tools and materials required for preparing PCBs, such as tweezers, cutters, flux, and anti-static mats.<br>• Understand the steps involved in workstation setup, pre-assembly checks, and component verification. | • Read and interpret circuit diagrams, assembly layouts, and BOM for preparing PCB assembly.<br>• Identify and sort electronic components (SMD and through-hole) as per the BOM and polarity requirements.<br>• Set up the assembly workstation with appropriate tools, materials, and ESD protection measures.<br>• Use high-resolution digital microscopes and soldering/rework stations with temperature control to inspect and fix defects on PCB assemblies accurately.<br>• Perform pre-assembly checks on PCBs and components to ensure they are defect-free and match specifications.<br>• Clean PCB surfaces and prepare components using suitable tools and techniques.<br>• Arrange components in trays or feeders for ease of access during assembly.<br>• Maintain proper documentation and labelling of components for traceability and workflow efficiency. |
| **Classroom Aids** | |
| Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop | |
| **Tools, Equipment and Other Requirements** | |

| |
|---|
| Bare Pcbs, Electronic Components Such as Resistor, Capacitor, Ics, Wiring Diagrams, Soldering Tools And Equipment, Solder, Flux, Soldering Iron, Magnifying Glass, Hand Tools Such As Lead Forming Tools, Cutter, Cutting Machine, Soldering Station, Testing Equipment, Anti-Static Gear |

## Module 2: PCB Assembly, Quality Check, and Delivery

*Mapped to ELE/N5107*

**Terminal Outcomes:**

- Work effectively at the workplace.
- Implement the practices related to gender and PwD sensitization.

| Duration: 60:00 | Duration: 90:00 |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • Understand the fundamentals of PCB assembly processes including component identification, placement, and soldering techniques.<br>• Describe different types of PCBs (single-sided, double-sided, multilayer) and their assembly requirements.<br>• Explain standard quality control checks in PCB assembly such as visual inspection, continuity testing, and defect identification.<br>• Interpret assembly drawings, BOM (Bill of Materials), and work instructions used in PCB production.<br>• Understand ESD precautions, handling practices, and cleanliness standards during assembly.<br>• Explain packaging, labelling, and documentation procedures required for delivery of finished PCBs.<br>• Understand the importance of following IPC standards and quality compliance in PCB manufacturing. | • Identify and place electronic components accurately on PCBs as per the assembly layout and BOM.<br>• Perform manual soldering and rework using proper tools and techniques, ensuring solder joint quality.<br>• Carry out visual inspection and continuity testing to detect assembly defects such as solder bridges, misaligned components, or cold joints.<br>• Handle PCBs and components using appropriate ESD precautions and cleanroom practices.<br>• Assemble using pick-and-place machines, perform quality checks with ICT (In-Circuit Testing) and track delivery using ERP systems for traceability.<br>• Follow assembly instructions, work orders, and standard operating procedures (SOPs) during the entire process.<br>• Complete proper labelling, packaging, and documentation for dispatching finished PCBs.<br>• Record quality check results and report any non-conformities or defects to the supervisor or quality team. |
| **Classroom Aids** | |
| Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop | |
| **Tools, Equipment and Other Requirements** | |
| ICT (In-Circuit Testing) Machine, Sample Of Escalation Matrix, Organization Structure. | |

## Module 3: 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<br>• Discuss 21st century skills<br>• Explain use of basic English phrases and sentences.<br>• Demonstrate how to communicate in a well-behaved manner<br>• Demonstrate how to work with others<br>• Demonstrate how to operate digital devices<br>• Discuss the significance of Internet and Computer/ Laptops<br>• Discuss the need for identifying business opportunities<br>• Discuss about types of customers.<br>• Discuss on creation of biodata<br>• 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<br>OR<br>Computer Lab | |

## Module 4: On-the-Job Training

*Mapped to PCB Assembly Technician*

| Mandatory Duration: 150:00 | Recommended Duration: 00:00 |
|---|---|
| **Location: On Site** | |

**Terminal Outcomes**

1. Explain basic electronics, component identification and characteristics of the components such as resistor, capacitor, ICs.
2. Explain various assembly processes such as thru-hole technology (THT), surface mount technology (SMT), and mixed technology.
3. Explain the basics of soldering such as handling the soldering iron, iron temperature, etc. and types of soldering such as dry and cold solder.
4. Mount the board on a holder or pallet to insert/install components appropriately.
5. Insert components into designated plated through-holes (PTH) as per the design.
6. Solder the components onto circuit board using the soldering station as per standard operating procedures (SOP).
7. Use magnifying glass to analyses the assembled board for any missing components, wrong value components, dry soldering etc.
8. Use professional language and behavior that is respectful of PwD and all genders.
9. Administer first aid in case of a minor accident.
10. Use fire extinguisher in case of a fire incident.

# Annexure

## Trainer Requirements

| Trainer Prerequisites | | | | | | |
|---|---|---|---|---|---|---|
| **Minimum Educational Qualification** | **Specialization** | **Relevant Industry Experience** | | **Training Experience** | | **Remarks** |
| | | ***Years*** | ***Specialization*** | ***Years*** | ***Specialization*** | |
| Diploma/ITI/ CITS certified in the relevant trade | Electronics/Electrical/Mechanical | 1 | PCB Assembly Operations | 1 | Electronics | |

| Trainer Certification | |
|---|---|
| **Domain Certification** | **Platform Certification** |
| "**PCB Assembly Technician**", "ELE/Q7804, v4.0", Minimum accepted score is 80% | Recommended that the Trainer is certified for the **PCB Assembly 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 the relevant CITS Trade | Electronics/Electrical/ Mechanical | 2 | PCB Assembly Operations | 1 | Electronics | |

| Assessor Certification | |
|---|---|
| **Domain Certification** | **Platform Certification** |
| "**PCB Assembly Technician**", "ELE/Q7804, v4.0", Minimum accepted score is 80% | Recommended that the Assessor is certified for the **PCB Assembly 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 |