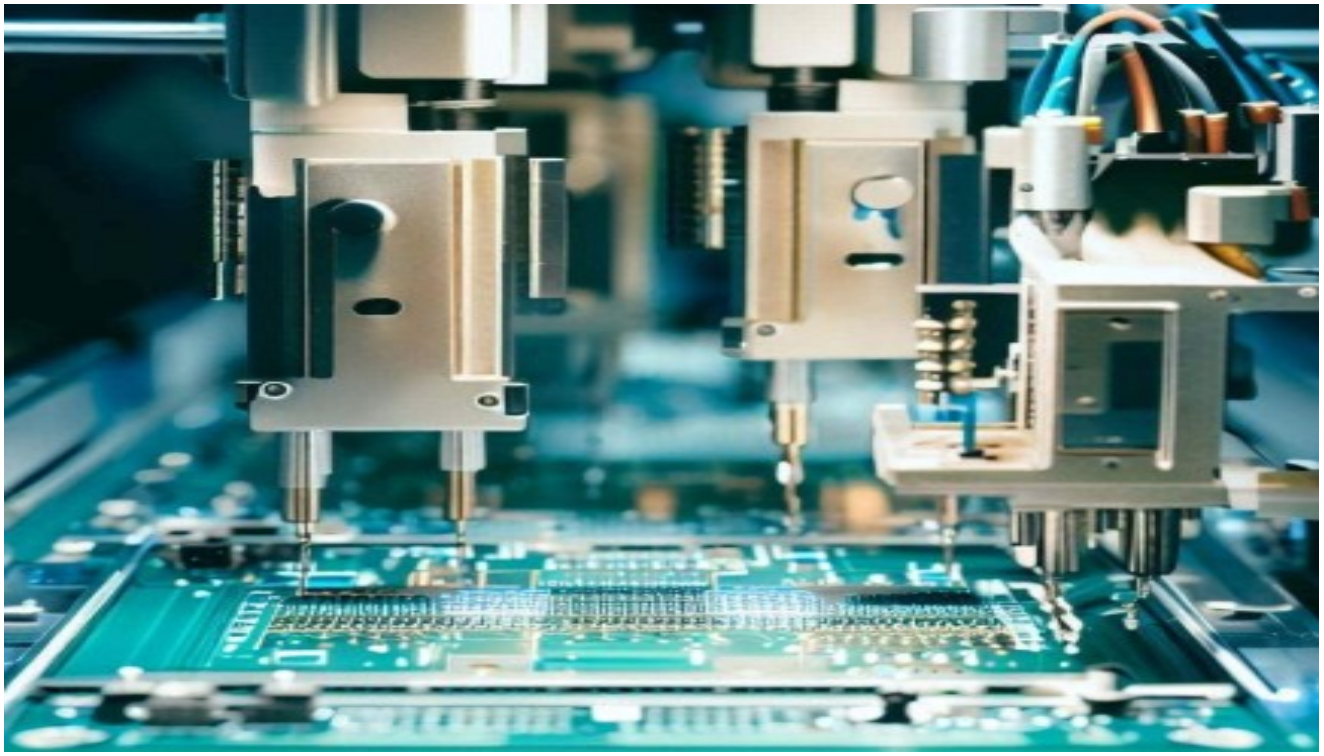

# Model Curriculum

**QP Name: Pick and Place Assembly Operator**

**QP Code: ELE/Q5102**

**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 EMS |
| **Country** | India |
| **NSQF Level** | 4 |
| **Aligned to NCO/ISCO/ISIC Code** | NCO-2015/ 8212.1603 |
| **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** | 510 Hours |
| **Maximum Duration of the Course** | 510 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 pick-and-place machine.
- 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/N5103: Assemble Printed Circuit Board (PCB) & components** | **60:00** | **120:00** | **00:00** | **60:00** | **240:00** |
| Module 1: Assemble Printed Circuit Board (PCB) | 60:00 | 120:00 | 00:00 | 60:00 | 240:00 |
| **ELE/N5102: Operate Pick-and Place Machine** | **60:00** | **90:00** | **00:00** | **90:00** | **240:00** |
| Module 2: Operate Pick-and Place Machine | 60:00 | 90:00 | 00:00 | 90:00 | 240:00 |
| **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** | **210:00** | **00:00** | **150:00** | **510:00** |

# Module Details

## Module 1: Assemble Printed Circuit Board (PCB) and components

*Mapped to ELE/N5103*

**Terminal Outcomes:**

- Role and responsibilities of a Pick and Place Assembly Operator
- Demonstrate the process of programming and loading the pick and place machine.
- Demonstrate the process of loading components and operating the machine for assembling on PCBs.
- Describe the process of inspecting assembly cycle for completion.
- Demonstrate the process of performing preventive maintenance of the machine.

| Duration: 60:00 | Duration: 120:00 |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • Describe the role and responsibilities of a Sr. Operator – Pick and Place Assembly; explain the scope of surface mount technology (SMT) in electronics manufacturing and the working principle of Pick and Place machines used for automated, high-speed, and precision mounting of electronic components on PCBs.<br>• Knowledge of PTH & SMD Components<br>• and their identifications and package types.<br>• Process flow chart of Pick & Place<br>• Assembly<br>• Knowledge about Solder Paste and printing<br>• Explain how to operate Paste printing Machine<br>• Explain the importance of daily maintenance of solder paste printing machine<br>• Inspect the printed solder paste to check its consistency and desired accuracy.<br>• Identify components to be assembled accurately and their placement on the reel.<br>• Identify the width of component reels to ensure that they match the | • Setting up solder paste printing machine<br>• Measurement of solder paste height<br>• Setting up of Pick & Place machine<br>• Loading of Program Pick & Place Machine<br>• Load and check all components to the feeders according to program and then load the feeders according to chosen program<br>• Setting up of a hot air reflow machine<br>• Operation of Hot Air Reflow Machine<br>• Set up tools and components to make them ready for the machine assemble<br>• Adjust PCB transport rails for all machines<br>• Perform weakly greasing and cleaning of nozzles<br>• Perform regular cleaning as prescribed by machine manufacturer |

| | |
|---|---|
| specifications<br>• Follow proper ESD and contamination prevention handling practices | |
| **Classroom Aids** | |
| **Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop** | |
| **Tools, Equipment and Other Requirements** | |
| Various Through Hole Components of Different Values, Different types of SMD Components, White Board, Projector, Different types of PCB's Solder Paste, Solder Paste Printing Machine, Stencils, Flow chart of Assembly, Projector & White Board, Solder paste height, measurement equipment, Component Feeders, SMD Components, Pick & Place Machine, Thermal Profiler, Hot Air Reflow Machine | |

## Module 2: Operate Pick-and-Place Machine

*Mapped to ELE/N5102*

**Terminal Outcomes:**

- Operate pick-and-place machines for precise SMT component placement on PCBs.
- Perform setup, basic troubleshooting, and follow ESD and safety protocols.

| Duration: 60:00 | Duration: 90:00 |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| • Understand the working principle and functions of pick-and-place machines in SMT assembly.<br>• Identify various surface-mount components and their packaging formats (e.g., reels, trays).<br>• Explain the machine setup process, including feeder loading, nozzle selection, and PCB alignment.<br>• Describe common machine parameters and their role in accurate component placement.<br>• Understand the causes of placement errors and basic troubleshooting methods.<br>• Explain ESD precautions, safety practices, and maintenance requirements for machine operation.<br>• Interpret assembly drawings, production schedules, and standard operating procedures (SOPs). | • Set up the pick-and-place machine with correct feeders, nozzles, and SMT components as per job requirements.<br>• Set up and configure pick-and-place machines using automated feeder calibration, vision alignment systems, and touchscreen HMIs for precise PCB assembly operations.<br>• Load PCBs and align them properly using machine interface and vision systems.<br>• Run the pick-and-place program and monitor the component placement process.<br>• Operate high-speed SMT lines equipped with AI-driven component placement, real-time monitoring, and defect detection systems to ensure efficient and accurate production.<br>• Identify and correct common errors like misplacement, missing components, or feeder jams.<br>• Perform basic cleaning, maintenance, and calibration of the machine.<br>• Follow ESD and workplace safety protocols during all operations.<br>• Record production data, report deviations, and ensure proper documentation of the assembly process. |
| **Classroom Aids** | |

| |
|---|
| Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop |
| **Tools, Equipment and Other Requirements** |
| 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 Sr. Operator- Pick and Place Assembly*

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

**Terminal Outcomes**

1. Inspect the printed solder paste to check its consistency and desired accuracy
2. Adjust PCB transport rails for all machines.
3. Bend the wires so that the wiring has a neat appearance after completion.
4. Hand over the finished boards to the reflow machine operator/concerned personnel.
5. Perform weakly greasing and cleaning of nozzles.
6. Maintain machine periodically to avoid downtime.
7. Perform regular cleaning as prescribed by machine manufacturer.

# 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/ Electrical / Mechanical | 1 | Pick and Place Assembly Operator | 1 year preferably | Electronics | |

| Trainer Certification | |
|---|---|
| **Domain Certification** | **Platform Certification** |
| "**Pick and Place Assembly Operator**", "ELE/Q5102, v4.0", Minimum accepted score is 80% | Recommended that the Trainer is certified for the **Pick and Place Assembly Operator** "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/ Electrical/ Mechanical | 2 | Pick and Place Assembly Operator | 1 year preferably | Electronics | |

| Assessor Certification | |
|---|---|
| **Domain Certification** | **Platform Certification** |
| "**Pick and Place Assembly Operator**", "ELE/Q5102, v4.0", Minimum accepted score is 80% | Recommended that the Assessor is certified for the **Pick and Place Assembly Operator** "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 |