# Model Curriculum

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

**QP Code: ELE/Q5102**

**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/ 8212.1603 |
| **Minimum Educational Qualification and Experience** | 8th Grade Pass + NTC (2 years after 8th) + 2 Year NAC/relevant Experience) <br><br> OR <br> 10th Grade pass + 2 Year NTC/NAC/ relevant experience <br> OR <br> Certificate-NSQF (Level-3 in Maintenance Technician) with 2 Years of relevant Experience <br> OR <br> 12th Class <br> and <br> 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 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 |
|---|---|---|---|---|---|
| **Bridge Module** | **06:00** | **24:00** | **00:00** | **00:00** | **30:00** |
| Module 1: Introduction and orientation to the role of a pick and place assembly operator | 06:00 | 24:00 | 00:00 | 00:00 | 30:00 |
| **ELE/N5102: Operate pick-and-place machine** | **120:00** | **180:00** | **00:00** | **150:00** | **450:00** |
| Module 2: Process of operating pick-and-place machine | 120:00 | 180:00 | 00:00 | 150:00 | 450:00 |
| **ELE/N9905 Work effectively at the workplace** | **15:00** | **15:00** | **00:00** | **00:00** | **30:00** |
| Module 3: 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 4: 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 5: 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 a Pick and Place Assembly Operator
### Bridge Module

**Terminal Outcomes:**

- Discuss the job role of a Pick-and-Place Assembly Operator.

| Duration: 06:00 | Duration: 24:00 |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| <ul><li>Describe the size and scope of the electronic industry and its sub-sectors.</li><li>Discuss the role and responsibilities of a Pick-and-Place Assembly Operator.</li><li>Describe various employment opportunities for a Pick-and-Place Assembly Operator**.**</li></ul> | <ul><li>Familiarization with SMT Lines.</li><li>Awareness about the Machines used for Pick and Place</li></ul> |
| **Classroom Aids** | |
| **Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop** | |
| **Tools, Equipment and Other Requirements** | |
| **NA** | |

## Module 2: Process of operating pick and place machine
### Mapped to ELE/N5102

**Terminal Outcomes:**

- 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: 120:00 | Duration: 180:00 |
|---|---|
| **Theory – Key Learning Outcomes** | **Practical – Key Learning Outcomes** |
| <ul><li>Knowledge of PTH & SMD Components</li><li>and their identifications and package types.</li><li>Process flow chart of Pick & Place</li><li>Assembly</li><li>Knowledge about Solder Paste and printing</li><li>Explain how to operate Paste printing Machine</li><li>Explain the importance of daily maintenance of solder paste printing machine</li><li>Inspect the printed solder paste to check its consistency and desired accuracy.</li><li>Identify components to be assembled accurately and their placement on the reel.</li><li>Identify the width of component reels to ensure that they match the specifications</li><li>Follow proper ESD and contamination prevention handling practices</li></ul> | <ul><li>Setting up solder paste printing machine</li><li>Measurement of solder paste height</li><li>Setting up of Pick & Place machine</li><li>Loading of Program Pick & Place Machine</li><li>Load and check all components to the feeders according to program and then load the feeders according to chosen program</li><li>Setting up of a hot air reflow machine</li><li>Operation of Hot Air Reflow Machine</li><li>Set up tools and components to make them ready for the machine assemble</li><li>Adjust PCB transport rails for all machines</li><li>Perform weakly greasing and cleaning of nozzles</li><li>Perform regular cleaning as prescribed by machine manufacturer</li></ul> |
| **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 3: 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** |
| <ul><li>State the importance of work ethics and workplace etiquette</li><li>State the importance of effective communication and interpersonal skills.</li><li>Explain ways to maintain discipline at the workplace.</li><li>Discuss the common reasons for interpersonal conflict and ways of managing them effectively.</li><li>Discuss the importance of following organisational guidelines for dress code, time schedules, language usage and other behavioural aspects.</li><li>Explain the importance of working as per the workflow of the organisation to receive instructions and report problems.</li><li>Explain the importance of conveying information/instructions as per defined protocols to the authorised persons/team members.</li><li>Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information.</li><li>Describe the process of reporting grievances and unethical conduct such as data breaches, sexual harassment at the workplace, etc.</li><li>Explain the concept and importance of gender sensitivity and equality.</li><li>Discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD).</li></ul> | <ul><li>Develop a sample plan to achieve organisational goals and targets.</li><li>Create a sample feedback form to obtain feedback from customers, colleagues etc.</li><li>Roleplay to demonstrate the use of professional language and behaviour that is respectful of PwD and all genders.</li><li>Apply organisational protocol on data confidentiality and sharing only with the authorised personnel.</li></ul> |

| | |
|---|---|
| • 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 4: 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** |
| <ul><li>Discuss job-site hazards, risks and accidents.</li><li>Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials.</li><li>Elaborate on electronic waste disposal procedures.</li><li>Describe the process of disposal of hazardous waste</li><li>List the name and location of concerned people, documents and equipment for maintaining health and safety in the workplace.</li><li>Describe how to interpret warning signs while accessing sensitive work areas.</li><li>Explain the importance of good housekeeping.</li><li>Describe the importance of maintaining appropriate postures while lifting heavy objects.</li><li>List the types of fire and fire extinguishers.</li><li>Explain the importance of efficient utilisation of water, electricity and other resources.</li><li>List the common sources of pollution and ways to minimize it.</li><li>Describe the concept of waste management and methods of disposing hazardous waste.</li><li>Explain various warning and safety signs.</li><li>Describe different ways of preventing accidents at the workplace.</li></ul> | <ul><li>Demonstrate the use of protective equipment suitable as per tasks and work conditions.</li><li>Prepare a report to inform the relevant authorities about any abnormal situation/behaviour of any equipment/system.</li><li>Administer first aid in case of a minor accident.</li><li>Demonstrate the steps to free a person from electrocution safely.</li><li>Administer Cardiopulmonary Resuscitation (CPR).</li><li>Demonstrate the application of defined emergency procedures such as raising alarm, safe/efficient, evacuation, moving injured people, etc.</li><li>Prepare a sample incident report.</li><li>Use a fire extinguisher in case of a fire incident.</li><li>Demonstrate the correct method of lifting and handling heavy objects.</li></ul> |

| 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 5: 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** |
| <ul><li>Explain constitutional values, civic rights, responsibility towards society to become a responsible citizen</li><li>Discuss 21$^{st}$ century skills</li><li>Explain use of basic English phrases and sentences.</li><li>Demonstrate how to communicate in a well-behaved manner</li><li>Demonstrate how to work with others</li><li>Demonstrate how to operate digital devices</li><li>Discuss the significance of Internet and Computer/ Laptops</li><li>Discuss the need for identifying business opportunities</li><li>Discuss about types of customers.</li><li>Discuss on creation of biodata</li><li>Discuss about apprenticeship and opportunities related to it.</li></ul> | <ul><li>List different learning and employability related GOI and private portals and their usage</li><li>Show how to practice different environmentally sustainable practices.</li><li>Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, etc.</li><li>Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone</li><li>Demonstrate how to communicate in a well-mannered way with others.</li><li>Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette</li><li>Utilize virtual collaboration tools to work effectively</li><li>Demonstrate how to maintain hygiene and dressing appropriately.</li><li>Perform a mock interview</li></ul> |
| **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><br>OR<br><br>Computer Lab ||

## Module 6: On-the-Job Training
### Mapped to Pick and Place Assembly Operator

| 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, v3.0", Minimum accepted score is 80% | Recommended that the Trainer is certified for the **Pick & 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, v3.0", Minimum accepted score is 80% | Recommended that the Assessor is certified for the **Pick & 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 |