



Model Curriculum

QP Name: Through Hole Assembly Operator

QP Code: ELE/Q5101

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-2015/8212.1602
Minimum Educational Qualification and Experience	12th grade or equivalent OR 10th grade or equivalent with 3 years of experience OR Certificate-NSQF (Level-3 in relevant domain) with 3 Years of relevant Experience # 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	540 Hours
Maximum Duration of the Course	540 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 performing through-hole assembly on PCB components.
- 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/N5113: Perform through-hole assembly on PCB components	45:00	60:00	00:00	60:00	165:00
Module 1: Perform Through-Hole Assembly on PCB Components	45:00	60:00	00:00	60:00	165:00
ELE/N5114: Operate the Through-Hole Machine for Automated Assembling	45:00	60:00	00:00	60:00	165:00
Module 2: Operate the Through-Hole Machine for Automated Assembling	45:00	60:00	00:00	60:00	165:00
ELE/N5115: Maintain and Troubleshoot Through-Hole Assembly Equipment	45:00	60:00	00:00	75:00	180:00
Module 3: Maintain and Troubleshoot Through-Hole Assembly Equipment	45:00	60:00	00:00	75:00	180:00
DGT/VSQ/N0101- Employability Skills (60 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	165:00	180:00	00:00	195:00	540:00

Module Details

Module 1: Perform through-hole assembly on PCB components

Mapped to ELE/N5113

Terminal Outcomes:

- Role and responsibilities of a Through Hole Assembly Operator.
- Demonstrate the process of mounting the components on the PCB.
- Demonstrate the process of operating the through-hole machine for automated assembling.
- Undertake preventive maintenance of the machine.

Duration: 45:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Describe the role and responsibilities of a Sr. Operator – Through Hole Assembly; explain the scope of through-hole technology in electronics manufacturing and the use of axial/radial insertion machines, digital assembly instructions, and related tools for efficient PCB assembly. • Understand the concept and importance of through-hole technology in PCB assembly. • Identify different types of through-hole components and their symbols, pin configuration, and polarity. • Explain the steps involved in manual through-hole component placement and soldering. • Describe the tools and materials used in through-hole assembly, such as soldering iron, flux, and solder wire. • Understand PCB layout, component legends, and hole alignment techniques. • Explain common defects in through-hole soldering and their causes (e.g., cold solder joints, solder bridges). • Understand ESD precautions, safety guidelines, and quality standards relevant to through-hole assembly (e.g., IPC-A-610).	• Identify and collect required through-hole components as per the Bill of Materials (BOM) and assembly drawings. • Assemble PCB components using Axial and Radial Insertion Machines • Place through-hole components correctly on the PCB following polarity and orientation guidelines. • Perform manual soldering of through-hole components using proper soldering techniques and tools. • Inspect solder joints for quality and rectify common defects like cold joints or solder bridges. • Handle components and PCBs using appropriate ESD safety measures and tools. • Clean the PCB after soldering and check for component stability and alignment. • Record assembly data and report any issues or deviations as per standard operating procedures.
Classroom Aids	

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop**Tools, Equipment and Other Requirements**

Component Feeder, nozzles Solder Paste, Stencils, soldering tools, Hand tools such as tweezers, piers Cutter, Vernier Callipers, TH Component, Axial and Radial Insertion Machines, Manual Forming Machine, Desktop and programming software, PCB blueprint.

Module 2: Operate the Through-Hole Machine for Automated Assembling

Mapped to ELE/N5114

Terminal Outcomes:

- Operate through-hole insertion machines for automated component placement on PCBs as per specified assembly layouts and process parameters.
- Perform basic machine maintenance, troubleshoot common issues, and follow safety and ESD guidelines during machine operation.

Duration: 45:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Understand the working principles and functions of automated through-hole insertion machines. • Identify various through-hole components compatible with automated insertion processes. • Explain the setup procedures, machine parameters, and programming basics for automated assembly. • Understand the role of feeders, insertion heads, conveyors, and PCB handling systems. • Describe common faults, error codes, and basic troubleshooting techniques. • Understand quality standards and inspection criteria relevant to automated through-hole assembly. • Explain the importance of ESD safety, machine maintenance protocols, and workplace safety guidelines.	• Set up the through-hole insertion machine with appropriate components, tools, and feeder units as per assembly requirements. • Load PCBs and run automated insertion programs following standard operating procedures (SOPs). • Monitor machine operation and ensure accurate component placement on the PCB. • Use screen-based or Digital Assembly Instruction to replace printed manuals, enhancing assembly accuracy and reducing errors. • Identify and respond to common machine errors, jams, or misalignments during the assembly process. • Perform routine cleaning and basic maintenance of the machine for optimal performance. • Follow ESD safety practices and workplace safety protocols while operating the equipment. • Record production and quality data and communicate any defects or deviations to the supervisor.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Sample Of Escalation Matrix, Organization Structure.	

Module 3: Maintain and Troubleshoot Through-Hole Assembly Equipment

Mapped to ELE/N5115

Terminal Outcomes:

- Perform routine maintenance and servicing of through-hole assembly equipment to ensure optimal and safe functioning.
- Identify, diagnose, and troubleshoot common mechanical and operational issues in through-hole machines, following safety and quality standards.

Duration: 45:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Understand the structure, components, and working principles of through-hole assembly equipment. • Describe the importance of regular maintenance and its impact on machine performance and product quality. • Identify common mechanical, electrical, and software-related issues in through-hole insertion machines. • Understand standard troubleshooting methods, tools, and diagnostic procedures. • Interpret error codes, maintenance logs, and machine manuals for problem-solving. • Explain safety protocols and lockout/tagout (LOTO) procedures during maintenance and repair. • Understand documentation practices related to maintenance records and issue reporting.	• Perform routine cleaning, lubrication, and preventive maintenance of through-hole assembly machines as per SOPs. • Identify and troubleshoot common mechanical or electrical issues such as misalignment, feed errors, or soldering faults. • Use diagnostic tools and indicators to detect faults and verify machine status. • Replace worn-out or faulty parts and calibrate machine settings as required. • Follow safety procedures, including lockout/tagout (LOTO), while performing maintenance activities. • Document maintenance activities, issues identified, and corrective actions taken in maintenance logs. • Coordinate with the supervisor or maintenance team for unresolved or complex issues.

Classroom Aids

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

Tools, Equipment and Other Requirements

Sample Of Escalation Matrix, Organization Structure.

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 Through Hole Assembly Operator

Mandatory Duration: 195:00

Recommended Duration: 00:00

Location: On Site

Terminal Outcomes

1. Check the placement and that inserted components are straight.
2. Hand over the assembled boards to wave solder machine operator.
3. Set up tools and parts to operate the machine.
4. Control the component insertion sequence and leads formation in order to match dimensions of holes with component.
5. Set the machine to zero setting in order to start the machine.
6. Maintain machine to avoid unscheduled downtime.

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	Through Hole Assembly Operator	1 year preferably	Electronics	

Trainer Certification	
Domain Certification	Platform Certification
“Through Hole Assembly Operator”, “ELE/Q5101, v4.0”, Minimum accepted score is 80%	Recommended that the Trainer is certified for the Through Hole 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	Through-Hole Assembly Operator	1 year preferably	Electronics	

Assessor Certification	
Domain Certification	Platform Certification
“Through Hole Assembly Operator”, “ELE/Q5101, v4.0”, Minimum accepted score is 80%	Recommended that the Assessor is certified for the Through Hole 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

