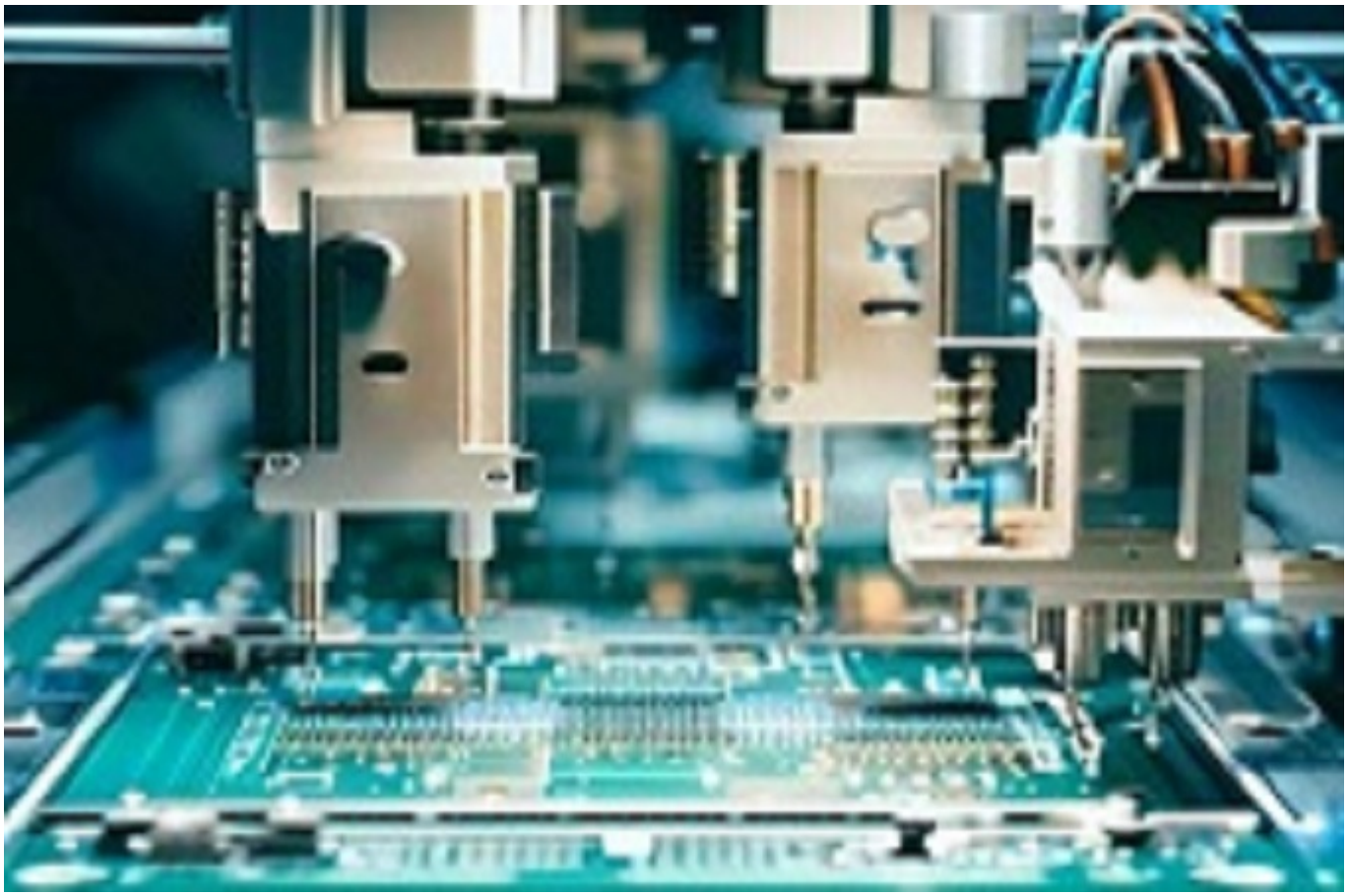
Qualification Pack



Pick and Place Assembly Operator

QP Code: ELE/Q5102

Version: 4.0

NSQF Level: 4

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Contents

Qualification Pack

ELE/Q5102: Pick and Place Assembly Operator

Brief Job Description

A Pick and Place Assembly Operator at work programs, operates and maintains the automated pick-and-place machine for placing different types of components on the surface of PCBs for soldering

Personal Attributes

The job requires the individual to have: attention to details, good eyesight and visual accuracy and to work for long hours generally in a standing position

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ELE/N5103: Assemble Printed Circuit Board (PCB) & Components
2. ELE/N5102: Operate Pick-and-Place Machine
3. DGT/VSQ/N0101: Employability Skills (30 Hours)

Qualification Pack (QP) Parameters

Sector	Electronics
Sub-Sector	Electronics Manufacturing System
Occupation	Assembly-EMS
Country	India
NSQF Level	4
Credits	17
Aligned to NCO/ISCO/ISIC Code	NCO-2015/ 8212.1603

Qualification Pack

Minimum Educational Qualification & Experience	12th grade Pass (12th grade or equivalent) with NA of experience OR 10th grade pass (10th gradeor equivalent) with 3 Years of experience Relevant Experience in Electronics Manufacturing Services OR Previous relevant Qualification of NSQF Level (Level-3 in relevant domain) with 3 Years of experience Relevant Experience in Electronics Manufacturing Services
Minimum Level of Education for Training in School	10th Class
Pre-Requisite License or Training	NA
Minimum Job Entry Age	16 Years
Last Reviewed On	NA
Next Review Date	07/10/2028
NSQC Approval Date	07/10/2025
Version	4.0
Reference code on NQR	QG-04-EH-044812025-V2-ESSCI
NQR Version	2

Remarks:

NA

Qualification Pack

ELE/N5103: Assemble Printed Circuit Board (PCB) & Components

Description

This NOS is about to perform accurate placement and soldering of electronic components on PCBs while ensuring functionality and quality standards

Scope

The scope covers the following :

- This NOS defines the skills and knowledge required to assemble electronic components on printed circuit boards (PCBs) using appropriate tools, techniques, and quality procedures

Elements and Performance Criteria

Introduction and Prerequisites to Printed Circuit Board Assembly

To be competent, the user/individual on the job must be able to:

PC1. 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.

PC2. Identify daily work requirements, including PCB design specifications, from the supervisor and arrange the required tools for PCB assembly, such as a wire cutter, pliers, and soldering iron.

PC3. Collect the PCB board, electronic components, and module software as per the requirement.

PC4. Inspect the board and components for any errors and get them rectified/replaced accordingly.

Assemble PCB

To be competent, the user/individual on the job must be able to:

PC5. Mount the board on a holder or pallet to insert/install components appropriately

PC6. Insert components into designated plated through-holes (PTH) as per the design

PC7. Inspect the soldering station before starting work to resolve any potential issues

PC8. Solder the components onto the circuit board using the soldering station as per standard operating procedures (SOP).

PC9. Analyze the assembled board using a magnifying glass to check for missing components, incorrect values, or dry soldering

PC10. Conduct a functional test of the PCB assembly to identify soldering-related errors

PC11. Rework to rectify soldering errors or any other identified issues to ensure the board passes the functional test

PC12. Maintain documentation of assembled components and deliver the completed board to the device assembly team on time

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Understand the role, responsibilities, and importance of SMT and Pick & Place technology in automated PCB assembly processes.

KU2. Knowledge of PCB design specifications, component types, polarity markings, and plating standards to ensure correct placement.

KU3. Awareness of inspection requirements, including identifying defects such as damaged components, incorrect values, or board faults before assembly.

KU4. Understanding soldering principles, ESD safety, SOPs for handling PCBs, and quality requirements for secure component mounting.

KU5. Knowledge of functional testing methods, documentation standards, and workflow coordination with the assembly team.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Ability to interpret supervisor instructions, arrange tools, and manage work based on assembly schedules.

GS2. Skill in handling PCBs and inserting components accurately using tools and fixtures without causing physical damage.

GS3. Proficiency in soldering components as per SOPs and reworking errors by using proper tools and techniques.

GS4. Competence in inspecting assembled boards with magnifiers, identifying faults, and performing corrective actions.

GS5. Skill in maintaining accurate documentation, delivering boards on time, and ensuring smooth coordination with other production teams.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction and Prerequisites to Printed Circuit Board Assembly	**12**	**16**	**-**	**3**
PC1. 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.	-	-	-	-
PC2. Identify daily work requirements, including PCB design specifications, from the supervisor and arrange the required tools for PCB assembly, such as a wire cutter, pliers, and soldering iron.	-	-	-	-
PC3. Collect the PCB board, electronic components, and module software as per the requirement.	-	-	-	-
PC4. Inspect the board and components for any errors and get them rectified/replaced accordingly.	-	-	-	-
Assemble PCB	**28**	**34**	**-**	**7**
PC5. Mount the board on a holder or pallet to insert/install components appropriately	-	-	-	-
PC6. Insert components into designated plated through-holes (PTH) as per the design	-	-	-	-
PC7. Inspect the soldering station before starting work to resolve any potential issues	-	-	-	-
PC8. Solder the components onto the circuit board using the soldering station as per standard operating procedures (SOP).	-	-	-	-
PC9. Analyze the assembled board using a magnifying glass to check for missing components, incorrect values, or dry soldering	-	-	-	-
PC10. Conduct a functional test of the PCB assembly to identify soldering-related errors	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. Rework to rectify soldering errors or any other identified issues to ensure the board passes the functional test	-	-	-	-
PC12. Maintain documentation of assembled components and deliver the completed board to the device assembly team on time	-	-	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N5103
NOS Name	Assemble Printed Circuit Board (PCB) & Components
Sector	Electronics
Sub-Sector	
Occupation	Assembly-EMS
NSQF Level	4
Credits	8
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

ELE/N5102: Operate Pick-and-Place Machine

Description

This NOS unit is about assembling surface-mount components on the printed circuit boards (PCB) by operating the automated pick-and-place machine after loading with reels of components and program as well as maintaining the machine

Scope

The scope covers the following :

- Program and Load the Pick-and-Place Machine
- Load Components and Operate the Machine for PCB Assembly
- Perform Preventive Maintenance of the Machine
- Apply Workplace Health and Safety

Elements and Performance Criteria

Program and Load the Pick-and-Place Machine

To be competent, the user/individual on the job must be able to:

PC1. Inspect the printed solder paste for consistency and desired accuracy.

PC2. Load specified programs on the machine according to the PCB assembly plan

PC3. Identify components for assembly and ensure their accurate placement on the reel.

PC4. Troubleshoot and optimize the program if anomalies are detected.

Load Components and Operate the Machine for PCB Assembly

To be competent, the user/individual on the job must be able to:

PC5. Set up and configure pick-and-place machines using automated feeder calibration, vision alignment systems, and touchscreen HMIs for precise PCB assembly operations

PC6. Operate high-speed SMT lines equipped with AI-driven component placement, real-time monitoring, and defect detection systems to ensure efficient and accurate production

PC7. Adjust PCB transport rails for all machines

PC8. Check the PCB and components received from the screen-printing section before assembly

PC9. Visually inspect the solder paste before initiating the pick-and-place operation.

PC10. Verify that all components are correctly placed as per design specifications

Perform Preventive Maintenance of the Machine

To be competent, the user/individual on the job must be able to:

PC11. Perform periodic greasing and nozzle cleaning

PC12. Maintain the machine regularly to avoid downtime

PC13. Ensure that correct components are placed on PCBs to prevent damage to the machine

PC14. Keep component reels in designated storage after use to maintain safety

PC15. Follow industry standards and compliance guidelines for zero-defect assembly

Apply Workplace Health and Safety

To be competent, the user/individual on the job must be able to:

PC16. Use appropriate PPE such as ESD wrist straps, gloves, and goggles during machine operation

PC17. Follow ESD precautions to protect components from electrostatic damage

PC18. Report any machine faults or safety hazards to the supervisor promptly.

PC19. Keep the workstation clean and tools organized to avoid accidents.

PC20. Handle and dispose of materials like solder paste safely as per guidelines

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Understand pick-and-place machine programming, SMT process sequence, and PCB assembly plans for accurate component placement

KU2. Knowledge of component packaging types (reel, tray, tube), feeder arrangement, and machine vision alignment systems

KU3. Awareness of solder paste inspection standards, PCB handling procedures, and error-free assembly requirements.

KU4. Understanding preventive maintenance principles including nozzle cleaning, lubrication, and ESD-safe equipment handling

KU5. Knowledge of safety guidelines, material handling rules, hazardous work precautions, and ESD compliance standards

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Ability to load programs, optimize parameters, and troubleshoot anomalies in automated pick-and-place machines

GS2. Skill in operating SMT equipment, calibrating feeders, and adjusting PCB transport rails with high precision

GS3. Inspection and verification skills to ensure correct solder paste application and placement of components.

GS4. Ability to perform routine maintenance efficiently to reduce downtime and maintain machine productivity.

GS5. Competence in maintaining workplace discipline proper PPE use, hazard reporting, and safe handling/storage of materials.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Program and Load the Pick-and-Place Machine	**8**	**10**	**-**	**2**
PC1. Inspect the printed solder paste for consistency and desired accuracy.	-	-	-	-
PC2. Load specified programs on the machine according to the PCB assembly plan	-	-	-	-
PC3. Identify components for assembly and ensure their accurate placement on the reel.	-	-	-	-
PC4. Troubleshoot and optimize the program if anomalies are detected.	-	-	-	-
Load Components and Operate the Machine for PCB Assembly	**12**	**17**	**-**	**4**
PC5. Set up and configure pick-and-place machines using automated feeder calibration, vision alignment systems, and touchscreen HMIs for precise PCB assembly operations	-	-	-	-
PC6. Operate high-speed SMT lines equipped with AI-driven component placement, real-time monitoring, and defect detection systems to ensure efficient and accurate production	-	-	-	-
PC7. Adjust PCB transport rails for all machines	-	-	-	-
PC8. Check the PCB and components received from the screen-printing section before assembly	-	-	-	-
PC9. Visually inspect the solder paste before initiating the pick-and-place operation.	-	-	-	-
PC10. Verify that all components are correctly placed as per design specifications	-	-	-	-
Perform Preventive Maintenance of the Machine	**10**	**13**	**-**	**3**
PC11. Perform periodic greasing and nozzle cleaning	-	-	-	-
PC12. Maintain the machine regularly to avoid downtime	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. Ensure that correct components are placed on PCBs to prevent damage to the machine	-	-	-	-
PC14. Keep component reels in designated storage after use to maintain safety	-	-	-	-
PC15. Follow industry standards and compliance guidelines for zero-defect assembly	-	-	-	-
Apply Workplace Health and Safety	**10**	**10**	**-**	**1**
PC16. Use appropriate PPE such as ESD wrist straps, gloves, and goggles during machine operation	-	-	-	-
PC17. Follow ESD precautions to protect components from electrostatic damage	-	-	-	-
PC18. Report any machine faults or safety hazards to the supervisor promptly.	-	-	-	-
PC19. Keep the workstation clean and tools organized to avoid accidents.	-	-	-	-
PC20. Handle and dispose of materials like solder paste safely as per guidelines	-	-	-	-
NOS Total	**40**	**50**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N5102
NOS Name	Operate Pick-and-Place Machine
Sector	Electronics
Sub-Sector	Electronics Manufacturing System
Occupation	Assembly-EMS
NSQF Level	4
Credits	8
Version	3.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

DGT/VSQ/N0101: Employability Skills (30 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. understand the significance of employability skills in meeting the job requirements

Constitutional values – Citizenship

To be competent, the user/individual on the job must be able to:

PC2. identify constitutional values, civic rights, duties, personal values and ethics and environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC3. explain 21st Century Skills such as Self-Awareness, Behavior Skills, Positive attitude, self-motivation, problem-solving, creative thinking, time management, social and cultural awareness, emotional awareness, continuous learning mindset etc.

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC4. speak with others using some basic English phrases or sentences

Communication Skills

To be competent, the user/individual on the job must be able to:

PC5. follow good manners while communicating with others

PC6. work with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC7. communicate and behave appropriately with all genders and PwD

PC8. report any issues related to sexual harassment

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC9. use various financial products and services safely and securely

PC10. calculate income, expenses, savings etc.

PC11. approach the concerned authorities for any exploitation as per legal rights and laws

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC12. operate digital devices and use its features and applications securely and safely

PC13. use internet and social media platforms securely and safely

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC14. identify and assess opportunities for potential business

PC15. identify sources for arranging money and associated financial and legal challenges

Customer Service

To be competent, the user/individual on the job must be able to:

PC16. identify different types of customers

PC17. identify customer needs and address them appropriately

PC18. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC19. create a basic biodata

PC20. search for suitable jobs and apply

PC21. identify and register apprenticeship opportunities as per requirement

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use basic spoken English language

KU6. Do and dont of effective communication

KU7. inclusivity and its importance

KU8. different types of disabilities and appropriate communication and behaviour towards PwD

KU9. different types of financial products and services

KU10. how to compute income and expenses
KU11. importance of maintaining safety and security in financial transactions
KU12. different legal rights and laws
KU13. how to operate digital devices and applications safely and securely
KU14. ways to identify business opportunities
KU15. types of customers and their needs
KU16. how to apply for a job and prepare for an interview
KU17. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. communicate effectively using appropriate language
GS2. behave politely and appropriately with all
GS3. perform basic calculations
GS4. solve problems effectively
GS5. be careful and attentive at work
GS6. use time effectively
GS7. maintain hygiene and sanitisation to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	**1**	**1**	**-**	**-**
PC1. understand the significance of employability skills in meeting the job requirements	-	-	-	-
Constitutional values – Citizenship	**1**	**1**	**-**	**-**
PC2. identify constitutional values, civic rights, duties, personal values and ethics and environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	**1**	**3**	**-**	**-**
PC3. explain 21st Century Skills such as Self-Awareness, Behavior Skills, Positive attitude, self-motivation, problem-solving, creative thinking, time management, social and cultural awareness, emotional awareness, continuous learning mindset etc.	-	-	-	-
Basic English Skills	**2**	**3**	**-**	**-**
PC4. speak with others using some basic English phrases or sentences	-	-	-	-
Communication Skills	**1**	**1**	**-**	**-**
PC5. follow good manners while communicating with others	-	-	-	-
PC6. work with others in a team	-	-	-	-
Diversity & Inclusion	**1**	**1**	**-**	**-**
PC7. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC8. report any issues related to sexual harassment	-	-	-	-
Financial and Legal Literacy	**3**	**4**	**-**	**-**
PC9. use various financial products and services safely and securely	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. calculate income, expenses, savings etc.	-	-	-	-
PC11. approach the concerned authorities for any exploitation as per legal rights and laws	-	-	-	-
Essential Digital Skills	**4**	**6**	**-**	**-**
PC12. operate digital devices and use its features and applications securely and safely	-	-	-	-
PC13. use internet and social media platforms securely and safely	-	-	-	-
Entrepreneurship	**3**	**5**	**-**	**-**
PC14. identify and assess opportunities for potential business	-	-	-	-
PC15. identify sources for arranging money and associated financial and legal challenges	-	-	-	-
Customer Service	**2**	**2**	**-**	**-**
PC16. identify different types of customers	-	-	-	-
PC17. identify customer needs and address them appropriately	-	-	-	-
PC18. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	**1**	**3**	**-**	**-**
PC19. create a basic biodata	-	-	-	-
PC20. search for suitable jobs and apply	-	-	-	-
PC21. identify and register apprenticeship opportunities as per requirement	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0101
NOS Name	Employability Skills (30 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	2
Credits	1
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/ Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/ PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ELE/N5103.Assemble Printed Circuit Board (PCB) & Components	40	50	-	10	100	40
ELE/N5102.Operate Pick-and-Place Machine	40	50	-	10	100	40
DGT/VSQ/N0101.Employability Skills (30 Hours)	20	30	-	-	50	20
Total	**100**	**130**	**-**	**20**	**250**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
IPR	Intellectual Property Rights
PCB	Printed Circuit Board

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.