Model Curriculum

QP Name: In-Process and Final Quality Engineer

QP Code: ELE/Q5501

QP Version: 3.0

NSQF Level: 5

Model Curriculum Version: 3.0

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	PCB Design and Manufacturing
Occupation	Quality Assurance
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/1213.0101
Minimum Educational Qualification and Experience	Diploma (After 10 (Electrical/Electronics/Mechanical)) with 1 Year of Relevant Experience OR 12th grade pass with 1 year NTC/ NAC with 1 Year of Relevant Experience OR 12th grade Pass with 2 Years of Relevant Experience OR Previous relevant Qualification of NSQF Level (4) with 3 Years of Relevant Experience OR 10th grade pass with 4 Years of Relevant Experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	24.02.2022
Next Review Date	24.02.2025
NSQC Approval Date	24.02.2022
QP Version	3.0
Model Curriculum Creation Date	24.02.2022
Model Curriculum Valid Up to Date	24.02.2025
Model Curriculum Version	3.0
Maximum Duration of the Course	780 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.

- Perform quality check of assembled PCBs.
- Record all documents and coordinate with various departments.
- Interact and coordinate with the supervisor and colleagues etc.
- Follow safe and healthy work practices.

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 (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module	**21:00**	**39:00**	**00:00**	**00:00**	**60:00**
Module 1: Introduction to the role of In-Process And Final Quality Engineer	21:00	39:00	00:00	00:00	60:00
ELE/N5501 – Check quality of assembled PCB	**180:00**	**240:00**	**210:00**	**00:00**	**630:00**
Module 2: Check quality of assembled PCB	180:00	240:00	210:00	00:00	630:00
ELE/N1002 – Apply Health and Safety Practices at the Workplace	**15:00**	**15:00**	**00:00**	**00:00**	**30:00**
Module 3: Basic Health and Safety Practices	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 4: Employability Skills (60 Hours)	24:00	36:00	00:00	00:00	60:00
Total Duration	**240:00**	**330:00**	**210:00**	**00:00**	**780:00**

Module Details

Module 1: Introduction to the role of In-Process and Final Quality Engineer

Bridge module

Terminal Outcomes:

- List the role and responsibilities of an In-Process and Final Quality Engineer.

Duration: *21:00*	**Duration**: *39:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the size and scope of the electronics industry and its various sub-sectors. • Discuss the various opportunities for an In-Process And Final Quality Engineer in the electronics industry. • Define the basics of electronics and related concepts. • Discuss the role and responsibilities of an In-Process And Final Quality Engineer. • Discuss organisational policies on incentives, delivery standards, personnel management and public relations (PR).	• Awareness of the various issues and Quality checks in the Assembly • Quality Assurance of the product and components in the Assembly • Factory Acceptance Testing of the product and components in the Assembly • Site Acceptance Testing of the product and components in the Assembly • Signing off with the customer for the product
Classroom Aids:	
Laptop, white board, marker, projector	
Tools, Equipment and Other Requirements	
NA	

Module 2: Check quality of assembled PCB

Mapped to ELE/N5501

Terminal Outcomes:

- Perform steps to check quality of assembled PCBs as per SOP.
- Maintain and update records and documents as per organisational procedures.

Duration: *180:00*	**Duration**: *240:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe basic electronics of different components and reading their values such as resistor, capacitor etc. • Discuss the information obtained from job sheet, customers and companys specification sheet. • Describe PCB assembly process. • Discuss the need of interpreting monthly or quarterly targets for the number of boards to be checked. • Elaborate applicable sampling plan, safety regulations, energy regulation, ESD regulations etc. • Describe testing methods followed for checking different PCBs. • List testing equipment, measuring instruments, gauges, parts etc. required during the quality inspection process. • Discuss the organisational process of collecting and arranging the testing equipment, measuring instruments, gauges, parts etc. from the store. • Summarise the steps to be performed for checking the calibration of tools, gauges and measuring instruments before use. • Discuss the safety practices to avoid any hazard and accident during quality inspection activities. • List QMS system guidelines followed in the organization. • Describe various tests need to perform for quality check of PCBs. • List the steps to be performed for conducting various tests for quality check. • List the documents and procedures involved in quality check. • List precautions to be taken while handling electronic products.	• Show how to record/ document the number of PCBs received. • Read the job sheet, customers and companys specification sheet and check against product specification required. • Perform 100 per cent testing and quality of each PCB as per company policy. • Perform functional checks on the PCBs. • Apply appropriate ways to monitor quality data and suggest improvements to reduce failure rate. • Apply appropriate ways to develop and implement process control techniques and procedures for manufacturing and manage improvement in quality maturity assessment score. • Dramatise a situation on how to work with a cross functional team with design, assembly and testing to develop the quality conformance, validation and simulation testing plan. • Show how to examine PCBs visually to detect circuit shorts. • Apply appropriate ways to record the output of the tests and check against specifications to approve the module as QC passed. • Apply appropriate ways to check the working of the test apparatus post-connecting the test component/ vehicle. • Apply appropriate ways to diagnose faults in the PCB. • Show how to inform the product development department or procurement department about faulty PCBs. • Show how to place stickers such as QC passed or Ok on the PCBs for quality passed ones. • Employ appropriate practices to make arrangements for sending okayed ones to

	the final packing and the faulty ones for rework. • Demonstrate organisational procedure of report the recurring problems to product development department or procurement department / senior management to take corrective actions. • Prepare all required documents and records related quality check.
Classroom Aids:	
Whiteboard, marker pen, computer or laptop attached to LCD projector, scanner, computer speakers	
Tools, Equipment and Other Requirements	
Basic tool box, Work bench with vice, Battery charger, High voltage battery, In vehicle power electronics, Riveting machine, drilling machine, riveting guns, pneumatic guns, fasteners, rubber seals, soldering iron, jigs, fixtures, adhesives, vernier calliper, micrometre, compass, divider, scriber, T Square, bevel protractor, pin set, torque meter Hand book, job orders, work order, completion material requests, and Technical Reference Books.	

Module 3: Basic Health and Safety Practices

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**
• Discuss job-site hazards, risks and accidents. • Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials. • Elaborate electronic waste disposal procedures. • Describe the process of disposal of hazardous waste • List the name and location of concerned people, documents and equipment for maintaining health and safety in the workplace. • Describe how to interpret warning signs while accessing sensitive work areas. • Explain the importance of good housekeeping. • Describe the importance of maintaining appropriate postures while lifting heavy objects. • List the types of fire and fire extinguishers. • Explain the importance of efficient utilisation of water, electricity and other resources. • List the common sources of pollution and ways to minimize it. • Describe the concept of waste management and methods of disposing hazardous waste. • Explain various warning and safety signs. • Describe different ways of preventing accidents at the	• Demonstrate the use of protective equipment suitable as per tasks and work conditions. • Prepare a report to inform the relevant authorities about any abnormal situation/behaviour of any equipment/system. • Administer first aid in case of a minor accident. • Demonstrate the steps to free a person from electrocution safely. • Administer Cardiopulmonary Resuscitation (CPR). • Demonstrate the application of defined emergency procedures such as raising alarm, safe/efficient, evacuation, moving injured people, etc. • Prepare a sample incident report. • Use a fire extinguisher in case of a fire incident. • Demonstrate the correct method of lifting and handling heavy objects.
Classroom Aids	
Training kit (Trainer guide, Presentations), White board, Marker, projector, laptop, flipchart.	
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 4: 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**
• 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.	• List different learning and employability related GOI and private portals and their usage • Show how to practice different environmentally sustainable practices. • Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, etc. • Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone • Demonstrate how to communicate in a well -mannered way with others. • Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette • Utilize virtual collaboration tools to workeffectively • Demonstrate how to maintain hygiene and dressing appropriately. • Perform a mock interview
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 In-Process and Final Quality Engineer

Mandatory Duration: *210:00*	**Recommended Duration**: *00:00*
Location: On Site	

Terminal Outcomes

1. Explain the fundamental concepts of electronics and electronics components
2. Identify testing tools, equipment, gauges etc required for testing process
3. Conduct quality checks on product during manufacturing process as per SOP
4. Conduct quality checks of finished product as per SOP
5. Record the observations of test and compare them with the specified data as per SOP
6. Maintain and update records and documents as per organisational procedures
7. Suggest improvements to reduce failure rate.
8. Develop and implement process control techniques and procedures for manufacturing and manage improvement in quality.
9. Work with a cross functional team with design, assembly and testing to develop the quality conformance, validation and simulation testing plan
10. Interact and coordinate with supervisor and colleagues
11. Work as per the given timeline and quality standards
12. Maintain a safe, healthy and secure work environment

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma/ Degree/ ITI/ Certified in relevant CITS Trade	(Electrical/Electronics/ Mechanical)	2	Quality Management - Electronics	1	Electronics	

Trainer Certification	
Domain Certification	**Platform Certification**
"In-Process and Final Quality Engineer, ELE/Q5501, version 3.0". Minimum accepted score is 80%.	Recommended that the Trainer is certified for the **In- process and Final Quality Engineer** "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/ Degree/ ITI/ Certified in relevant CITS Trade	(Electrical/Electronics/ Mechanical)	3	Quality Management - Electronics	1	Electronics	

Assessor Certification	
Domain Certification	**Platform Certification**
"In-Process and Final Quality Engineer, ELE/Q5501, version 3.0". Minimum accepted score is 80%.	Recommended that the Assessor is certified for the **In- process and Final Quality Engineer** "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
    - Assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records

2. Testing Environment:
    - 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 as 10 a.m. and 5 p.m.
    - If the batch size is more than 30, then there should be 2 Assessors.
    - 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
    - Assessor must be ToA certified & trainer must be ToT Certified
    - 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:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
    - 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 in the Hard Drives

References

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.

Acronyms and Abbreviations

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