Model Curriculum

QP Name: Electronic Hardware Assembly Operator

QP Code: ELE/Q6605

QP Version: 2.0

NSQF Level: 4

Model Curriculum Version: 2.0

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	E-Mobility & Battery
Occupation	Assembly – EM&B
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/8212.0400
Minimum Educational Qualification and Experience	8th Grade Pass + NTC (2 years after 8th) + 2 Year NAC/relevant Experience) OR 10th Grade pass + 2 Year NTC/NAC/ relevant experience OR Certificate-NSQF (Level-3 in Maintenance Technician) with 2 Years of relevant Experience OR 12th Class and 18 Years
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	30.12.2021
Next Review Date	30.12.2026
NSQC Approval Date	30.12.2021
QP Version	2.0
Model Curriculum Creation Date	30.12.2021
Model Curriculum Valid Up to Date	30.12.2026
Model Curriculum Version	2.0
Maximum Duration of the Course	450 Hours

Program Overview

This section summarises 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:

- Describe the role and responsibilities of an Electronic Hardware Assembly Operator
- Describe the process of reviewing the assembly design prepared by the Design department
- Demonstrate the process of inspecting the components to be assembled along with the tools to be used for assembly
- Explain the process of planning the assembly as per the quality, industry and compliance standards
- Demonstrate the process of assembling the electronic hardware using hand and power tools and assembly fixtures
- Demonstrate how to integrate various assembled components on chassis panels as per the Standard Operating Procedure (SOP)
- Explain the importance of complying with the globally accepted regulatory standards during testing
- Explain the process of testing electronic hardware assemblies against various performance parameters
- Explain the process of finding the cause of the problem if the test results diverge from specifications
- Demonstrate the use of correct techniques to rectify malfunctions as per the SOP
- Explain the importance of following inclusive practices with all genders and PwD a work
- Demonstrate the use of applicable health and safety equipment 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 (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module	**06:00**	**04:00**	**00:00**	**00:00**	**10:00**
Module 1: Introduction and orientation to the role of an Electronic Hardware Assembly Operator	06:00	04:00	00:00	00:00	10:00
ELE/N6607 Assemble Electronic Hardware	**30:00**	**60:00**	**60:00**	**00:00**	**150:00**
Module 2: Assembly of Electronic Hardware as per design	30:00	60:00	60:00	00:00	150:00
ELE/N6606 Test the Electronic Hardware assembly	**30:00**	**50:00**	**90:00**	**00:00**	**170:00**
Module 3: Testing of Electronics Hardware after assembly	30:00	50:00	90:00	00:00	170:00
ELE/N9905 Work effectively at the workplace	**15:00**	**15:00**	**00:00**	**00:00**	**30:00**
Module 4: Soft Skills and Work Ethics	15:00	15:00	00:00	00:00	30:00
ELE/N1002 Apply health and safety practices at workplace	**15:00**	**15:00**	**00:00**	**00:00**	**30:00**
Module 5: 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 6: Employability Skills (60 Hours)	24:00	36:00	00:00	00:00	60:00
Total Duration	**120:00**	**180:00**	**150:00**	**00:00**	**450:00**

Module Details

Module 1: Introduction and orientation to the role of an Electronic Hardware Assembly Operator

Terminal Outcomes:

- Describe the role and responsibilities of an Electronic Hardware Assembly Operator

Duration: 06:00	Duration: 04:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Describe the size and scope of the Electronics industry and its sub-sectors - Explain the functioning of an Electric Vehicle - Explain the application and functions of various Electronic Hardware in an Electric vehicle - State the role and responsibilities of an Electronic Hardware Assembly Operator - Discuss various employment opportunities for an Electronic Hardware Assembly Operator in the Electronics industry - State the organisational policies on incentives, personnel management reporting structure, etc.	Hands – on Assembly Line (Electronics Hardware)
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
NA	

Module 2: Assembly of Electronic Hardware as per design
Mapped to ELE/N6607

Terminal Outcomes:

- Explain the process of reviewing the assembly design prepared by the Design department
- Demonstrate the process of inspecting the components to be assembled and the tools to be used for assembly
- Explain the process of planning the assembly as per the quality, industry and compliance standards
- Demonstrate the process of assembling the electronic hardware using hand and power tools and assembly fixtures
- Explain how to integrate various assembled components on chassis panels as per the Standard Operating Procedure (SOP)

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- Explain the basic principles governing Electronics Engineering including the ionization and flow of electricity - Explain the quality, safety and environmental standards that must be followed while assembling Electronic Hardware - Explain the concepts of digital electronics, control engineering and communication protocols - Explain the terminologies, graphical representations, signs and symbols related to Electronic Hardware assemblies - Explain the specifications of various electronic hardware components - List different tools and equipment required for assembling various Electronic Hardware - Describe the process of mounting assembled components such as transformers, resistors, transistors, capacitors, integrated circuits (ICs), and sockets on the chassis - Explain how to interpret the assembly drawings, wire lists and work instructions - Explain how to estimate the	- Prepare a sample plan for the order of operations and positioning of components - Demonstrate the process of preparing electronic components for assembly operations - Demonstrate the process of constructing the electronic hardware assembly using hand/ power tools and assembly fixtures - Demonstrate the process of setting up various assembled components on chassis panels as per the Standard Operating Procedure (SOP)

requirement of various materials and wires of various jacks	

Classroom Aids

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

Tools, Equipment and Other Requirements

Various tools and equipment such as Soldering Station, Jigs, Fixture, Screw Guns, Torque Wrench, Digital Multimeter, IC Chip Extractor, Insulation Tape, Line Tester, Power Supply, Precision Screw Driver, Screw Driver Set, Shear Cutters, Soldering Flux, Soldering Iron, Torque Screwdriver Set, Universal Crimp Tool, Wire Stripper, Ac Power Source, Allen Key Set, Connecting Wire, Safety Helmet, Safety Shoes etc., organizational documents.

Module 3: Testing of Electronics Hardware after assembly
Mapped to ELE/N6606

Terminal Outcomes:

- Explain the importance of complying with the globally accepted regulatory standards while testing
- Demonstrate the process of testing the electronic hardware assemblies on various performance parameters
- Explain the process of finding the cause of the problem if the test results diverge from specifications
- Demonstrate the use of correct techniques to rectify faults as per the SOP

Duration: 30:00	Duration: 50:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
- Describe the globally accepted protocols for testing electronic hardware and devices - Explain the terminologies and repairing procedures given in the manufacturer's repair manual - State the standard specifications and performance parameters of various electronic devices - Explain the use of various testing equipment - Describe the process of assembling and disassembling electronic hardware - Describe the process of conducting root cause analysis and carrying out troubleshooting - Explain the process of reviewing the test results to find the root cause of the problem	- Demonstrate the process of checking the performance of electronic hardware fitted parts against various performance parameters - Demonstrate the use of relevant techniques to rectify faults
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Tools and various testing equipment such as Hydrometer, Multimeter, Line Tester, Connecting Wire, Safety Helmet, Safety Shoes etc. organizational documents.	

Module 4: Soft Skills and Work Ethics
Mapped to ELE/N9905

Terminal Outcomes:

- Work effectively at the workplace.
- Demonstrate practices related to gender and PwD sensitization

Duration: 15:00	Duration: 15:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
- State the importance of work ethics and workplace etiquette - State the importance of effective communication and interpersonal skills. - Explain ways to maintain discipline at the workplace. - Discuss the common reasons for interpersonal conflict and ways of managing them effectively. - Discuss the importance of following organisational guidelines for dress code, time schedules, language usage and other behavioural aspects. - Explain the importance of working as per the workflow of the organisation to receive instructions and report problems. - Explain the importance of conveying information/instructions as per defined protocols to the authorised persons/team members. - Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information. - Describe the process of reporting grievances and unethical conduct such as data breaches, sexual harassment at the workplace, etc. - Explain the concept and importance of gender sensitivity and equality. - Discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD). - Discuss ways of dealing with	- Develop a sample plan to achieve organisational goals and targets. - Create a sample feedback form to obtain feedback from customers, colleagues, etc. - Roleplay to demonstrate the use of professional language and behaviour that is respectful of PwD and all genders. - Apply organisational protocol on data confidentiality and sharing only with the authorised personnel.

heightened emotions of self and others.	

Classroom Aids

Training Kit (Trainer Guide, Presentations)

Tools, Equipment and Other Requirements

Sample Of Escalation Matrix, Organization Structure.

Module 5: 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**
- Discuss job-site hazards, risks and accidents. - Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials. - Elaborate on the 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 workplace.	- Demonstrate the use of protective equipment suitable as per tasks and work conditions. - Report any abnormal situation/behaviour of any equipment/system to the relevant authorities. - 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)
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 6: Employability Skills (60 Hours)
Mapped to DGT/VSQ/N0102

Terminal Outcomes:

1.   Discuss about Employability Skills in meeting the job requirements
2.   Describe opportunities as an entrepreneur.
3.   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 work effectively • 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 7: On-the-Job Training

Mapped to Electronic Hardware Assembly Operator

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

Terminal Outcomes

4. Explain the fundamental concept of an Electric Vehicle.
5. Explain the application and functions of various Electronic Hardware in an Electric Vehicle,
6. Review the design thoroughly before starting the assembly process.
7. Implement the necessary precautionary measures before the assembly.
8. Assemble electronic hardware as per the Standard Operating Procedure.
9. Conduct various standard tests for evaluating the performance of Electronic Hardware.
10. Implement necessary corrective measures after reviewing the test results.
11. Interact and co-ordinate with supervisor and colleagues.
12. Carry out the assigned work within the time limit and as per the defined quality standards.
13. Maintain a healthy, safe and secure working environment.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	*Specialization*	*Years*	*Specialization*	
Diploma/ ITI/ Certified n relevant CITS Trade	Electrical / Electronics/ Mechanical	1	Electronic Hardware Assembly Operator	1	Electronics	

Trainer Certification	
Domain Certification	**Platform Certification**
"Electronic Hardware Assembly Operator", "ELE/Q6605, v2.0", Minimum accepted score is 80%	Recommended that the Trainer is certified for the **Electronic Hardware 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 n relevant CITS Trade	Electrical / Electronics/ Mechanical	2	Electronic Hardware Assembly Operator	1	Electronics	

Assessor Certification	
Domain Certification	**Platform Certification**
"Electronic Hardware Assembly Operator", "ELE/Q6605, v2.0", Minimum accepted score is 80%	Recommended that the Assessor is certified for the **Electronic Hardware 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 two 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 levels 1 to 3 are for the unskilled & semi-skilled individuals, and levels 4 and above are for the skilled, supervisor & higher management
   - The assessor must be ToA certified & 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

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National
Skill Development
Corporation
Transforming the skill landscape

- 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 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	A key learning outcome is a 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	The 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
BEV	Battery Electric Vehicle
DC	Direct Current
EM&B	E-Mobility & Battery
IC	Integrated Circuit
ITI	Industrial Training Institute
MCU	MicroController Unit
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
UL	Underwriter Laboratories
VTP	Vocational Training Provider