



Model Curriculum

QP Name: EMS Operations & Maintenance Manager

QP Code: ELE/Q5312

QP Version: 3.0

NSQF Level: 6

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.....	3
Program Overview	4
Training Outcomes.....	4
Compulsory Modules.....	4
Module 1: Introduction and orientation to the role of an EMS Operations & Maintenance Manager .	6
Module 2: Process of managing SMT machines	7
Module 3: Process of managing production process, material quality and machines.....	9
Module 4: Basic Health and Safety Practice.....	10
Module 5: Employability Skills (60 Hours)	11
Module 6: On-the-Job Training.....	13
Annexure.....	15
Trainer Requirements	15
Assessor Requirements.....	16
Assessment Strategy.....	17
References	19
Glossary.....	19
Acronyms and Abbreviations.....	20

Training Parameters

Sector	Electronics
Sub-Sector	Electronics Manufacturing System
Occupation	Maintenance - PCB
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2152.9900
Minimum Educational Qualification and Experience	12th grade Pass with 4 Years of relevant experience OR 12th grade pass with 2 year NTC/ CITS/NAC with 2 Years of relevant experience OR Completed 2nd year diploma after 12th with 2 Years of relevant experience OR Completed 3 year UG degree with 1 Year of relevant experience OR Previous relevant Qualification of NSQF Level (5) with 3 Years of relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	21 Years
Last Reviewed On	27.01.2022
Next Review Date	27.01.2025
NSQC Approval Date	27.01.2022
QP Version	3.0
Model Curriculum Creation Date	27.01.2022
Model Curriculum Valid Up to Date	27.01.2025
Model Curriculum Version	3.0
Maximum Duration of the Course	900 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 managing SMT machines.
- Describe the process of managing production process, material quality and machines.
- 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 (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module	21:00	39:00	00:00	00:00	60:00
Module 1: Introduction and orientation to the role of an EMS Operations & Maintenance Manager	21:00	39:00	00:00	00:00	60:00
ELE/N5313: Manage SMT machines	90:00	150:00	120:00	00:00	360:00
Module 2: Process of managing SMT machines	90:00	150:00	120:00	00:00	360:00
ELE/N5314: Manage production process, material quality and machines	120:00	150:00	120:00	00:00	390:00
Module 3: Process of managing production process, material quality and machines	120:00	150:00	120:00	00:00	390:00
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	270:00	390:00	240:00	00:00	900:00

Module Details

Module 1: Introduction and orientation to the role of an EMS Operations & Maintenance Manager

Bridge Module

Terminal Outcomes:

- Discuss the job role of an EMS Operations & Maintenance Manager.

Duration: 21:00	Duration: 39:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Describe the size and scope of the electronics industry and its sub-sectors. • Discuss the role and responsibilities of an EMS Operations & Maintenance Manager. • Describe various employment opportunities for an EMS Operations & Maintenance Manager. 	<ul style="list-style-type: none"> • Familiarization with SMT Lines • Awareness of Assembly Components • Overview of the various tasks to be delegated to the Team • Management of the roles and responsibilities of the tasks assigned to the team • Awareness of the end component to be assembled by the respective team members assigned on the SMT
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
NA	

Module 2: Process of managing SMT machines

Mapped to ELE/N5313

Terminal Outcomes:

- Demonstrate the process of managing SMT machines.
- Demonstrate the process of maintaining documentation.

Duration: 90:00	Duration: 150:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain company’s policies on: incentives, delivery standards, and personnel management. • Explain the importance of the individuals role in the workflow. • Explain the importance of working in clean and safe environment practices and procedures. • Describe the standard operating procedures in the organisation such as magazine & pcb loading procedure, changeover procedure. • Explain the basic knowledge of electronics devices. • Describe various parts used in printed circuit board (pcb) assembly process. • Explain effective training methodologies to develop quality culture in the organization. • State various troubleshooting approaches - root cause analysis. • Explain various terms and conditions of manufacturing. • Explain how to read component drawing and interpret bill of material (bom). • Describe various methods to identify operational problems. • Explain the important terms used in the production. • Explain the importance of following standard operating procedures. • Explain how to interpret 	<ul style="list-style-type: none"> • Demonstrate the process of setting up chart for screen printer parameters such as program name, squeeze speed, 2D inspection mode, etc. • Demonstrate the process of creating and executing the program as per the standard procedure. • Demonstrate the process of setting the soaking temperature profile to maintain the temperature for air reflow oven and Nitrogen (N2) reflow oven and preparing the model-wise dummy PCB as per procedure. • Show how to check critical operating check points as per the standard check sheet. • Demonstrate the process of carrying out maintenance of the machinery as per the schedule. • Prepare sample documents as per the company policy documents: production report, work instructions, operating checkpoint, maintenance check-sheet, etc.

<p>manufacturer’s instructions.</p> <ul style="list-style-type: none"> • List various tools used to measure progress to target. • Describe test protocols for visual and functional testing of electrical parts and assemblies. 	
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>SMT machines, circuit boards, soldering equipment, Soldering unit, stencils, epoxy and soft solder bonders, high precision flip chip bonders, stacked die bonders, trim & form, package mould simulation and plating systems, Automatic wire bonders, multi axis welding machine, manual wire bonders, table top wire bonders, solder reflow systems and PPEs</p>	

Module 3: Process of managing production process, material quality and machines

Mapped to ELE/N5313

Terminal Outcomes:

- Explain the importance of controlling SMT material, consumables, equipment & spare parts.
- Explain the importance of planning production processes.
- Demonstrate the process of monitoring and controlling PCBA quality.
- Demonstrate the process of maintaining assembly line.
- Demonstrate the process of carrying out documentation.

Duration: 120:00	Duration: 150:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
<ul style="list-style-type: none"> • Explain company’s policies on incentives, delivery standards, and personnel management. • State the work flow involved in the assembly process of the company. • Explain the importance of the individual’s role in the workflow. • Explain the reporting structure, inter-dependent functions, lines and procedures in the work area. • Explain the importance of working in clean and safe environment practices and procedures. • Explain the basic knowledge of surface mount technology. • Describe the process of component drawing and interpret bill of material (BOM). • Explain how to calculate rlc (r-resistance, l- inductance, c- capacitor) values and read their polarity. • Describe the process of material handling & material in/out control. • Explain how to read component drawing and interpret bill of material (BOM). • Explain how to identify the component locations & type on PCB. • Explain the basic knowledge of SMT machines & spare parts. 	<ul style="list-style-type: none"> • Demonstrate how to identify material supply and in/out process. • Demonstrate the process of setting up the kitting system. • Show how to check storage check point for in/out process. • Demonstrate the process of monitoring consumable control procedure for smooth functioning. • Demonstrate the process of setting up of line to facilitate installation of equipment and equipment levelling. • Show how to verify the record quality data and monitoring report as per company policies. • Demonstrate how to monitor and manage the production process from loading bare PCB in loader to screen printer printing, solder paste inspection, mounting of components, soldering in reflow oven, inspection by AOI and un-loading of populated PCB in magazine rack. • Demonstrate cleaning and lubrication processes as prescribed by manufacturers. • Prepare sample reports, procedures, work instructions, setup chart and check-sheets as required.

<ul style="list-style-type: none"> • Explain the importance of standard operating procedures. • Explain how to interpret manufacturers instructions. • List various tools used to measure progress to target. • Explain how to estimate costs involved in each stage of production. • Describe effective training methodologies to develop quality culture in the organization. • Explain the importance of work instructions and workmanship. • Explain how to provide manufacturing data: production control charts, reliability, process capability etc. • State various quality standards used in the production and their importance. 	
<p>Classroom Aids</p>	
<p>Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop</p>	
<p>Tools, Equipment and Other Requirements</p>	
<p>SMT machines, circuit boards, soldering equipment, feeders, carriages and stencil printer Soldering unit, stencils, epoxy and soft solder bonders, high precision flip chip bonders, stacked die bonders, trim & form, package mould, simulation and plating systems, Automatic wire bonders, multi axis welding machine, manual wire bonders, table top wire bonders, solder reflow systems and PPEs</p>	

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 style="list-style-type: none"> • Discuss job-site hazards, risks and accidents. • Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials. • Elaborate on 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. 	<ul style="list-style-type: none"> • 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). 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 style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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 6: On-the-Job Training

Mapped to EMS Operations & Maintenance Manager

Mandatory Duration: 240:00	Recommended Duration: 00:00
Location: On Site	
<p>Terminal Outcomes</p> <ol style="list-style-type: none"> 1. Describe the standard operating procedures in the organisation such as magazine & pcb loading procedure, changeover procedure. 2. Set up chart for screen printer parameters such as program name, squeeze speed, 2D inspection mode, etc. 3. Create and execute the program as per the standard procedure. 4. Carry out maintenance of the machinery as per the schedule. 5. Set up the kitting system. 6. Set up of line to facilitate installation of equipment and equipment levelling. 7. Record quality data and monitoring report as per company policies. 8. Use professional language and behaviour that is respectful of PwD and all genders. 9. Use protective equipment suitable as per tasks and work conditions. 10. Administer first aid in case of a minor accident. 11. Use a fire extinguisher in case of a fire incident. 	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	Specialization	Years	Specialization	
BE/B.Tech/Certified in relevant CITS Trade	Electrical/ Electronics/ Mechanical	5	EMS	2	EMS	

Trainer Certification	
Domain Certification	Platform Certification
<p>“EMS Operations & Maintenance Manager”, “ELE/Q5312, v3.0”, Minimum accepted score is 80%</p>	<p>Recommended that the Trainer is certified for the EMS Operation and Maintenance Manager “Trainer (VET and Skills)”, mapped to the Qualification Pack: “MEP/Q2601, V2.0”, with minimum score of 80%</p>

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	Specialization	Years	Specialization	
BE/B.Tech/Certified in relevant CITS Trade	Electrical/ Electronics/ Mechanical	7	EMS	2	EMS	

Assessor Certification	
Domain Certification	Platform Certification
<p>“EMS Operations & Maintenance Manager”, “ELE/Q5312, v3.0”, Minimum accepted score is 80%</p>	<p>Recommended that the Assessor is certified for the EMS Operation & Maintenance Manager“ Assessor (VET and Skills)”, mapped to the Qualification Pack: “MEP/Q2701, V2.0”, with minimum score of 80%</p>

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