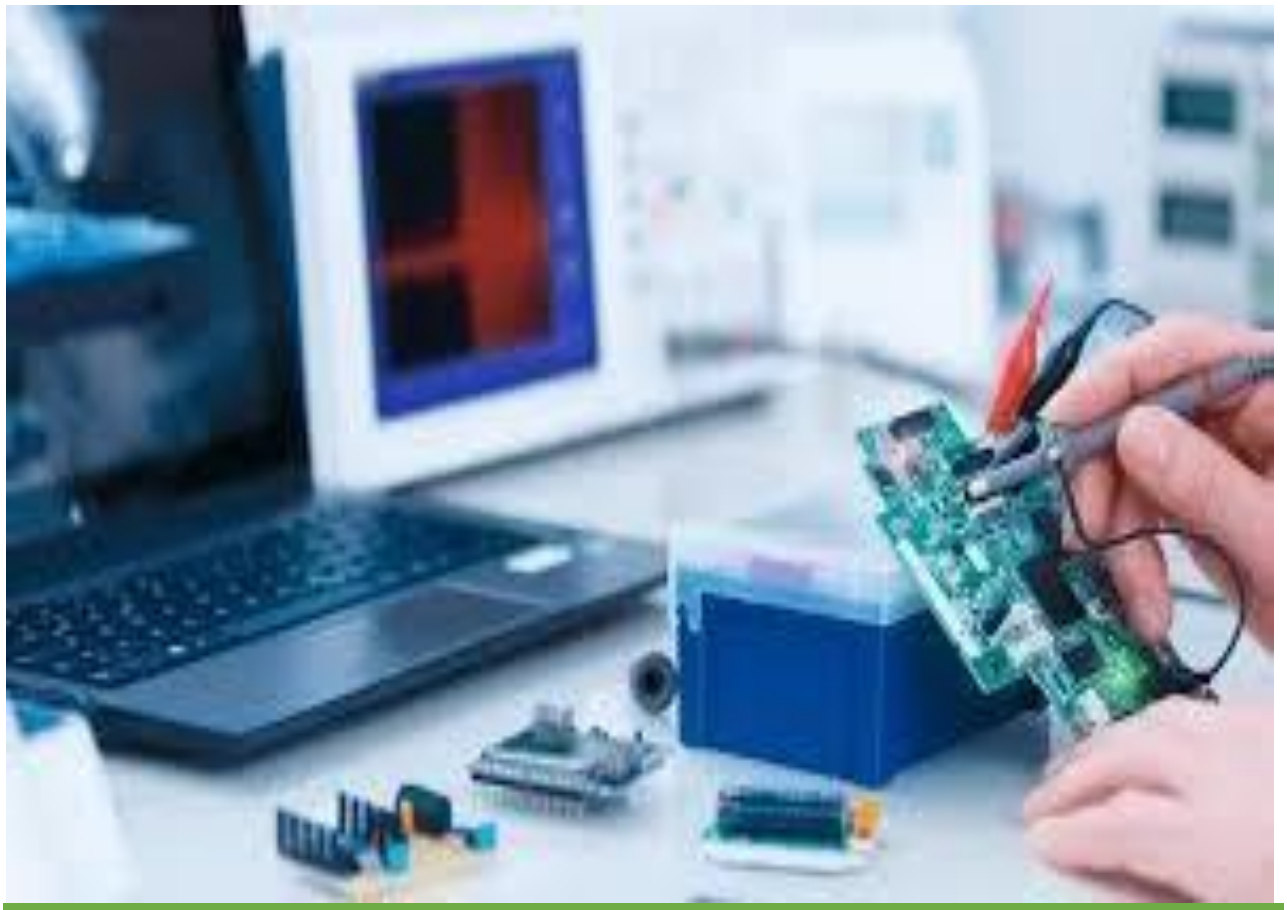

Model Curriculum

QP Name: IoT Hardware Analyst

QP Code: ELE/Q1405

QP Version: 4.0

NSQF Level: 5

Model Curriculum Version: 4.0

Electronics Sector Skills Council of India (ESSC!) ESC House, 2nd Floor IS, Okhla Industrial Area- Phase 1lI NewDelhi-I I0020

Table of Contents

Training Parameters

Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Product Design-S&C
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2152.0801
Minimum Educational Qualification and Experience	Completed 2nd year of UG (UG Diploma) (Physics/Electronics / Electrical/Computer Science) with 1.5 years of Relevant experience OR Completed 3 year diploma after 10th (Electronics/Electrical /Computer Science) with 3 Years of Relevant experience OR Previous relevant Qualification of NSQF Level (4.5) with 1.5 years of Relevant experience # Relevant experience in the Electronics domain.
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	01.05.2025
Next Review Date	30.04.2028
NSQC Approval Date	08.05.2025
QP Version	4.0
Model Curriculum Creation Date	01.05.2025
Model Curriculum Valid Up to Date	30.04.2028
Model Curriculum Version	4.0
Minimum Duration of the Course	450 Hours
Maximum Duration of the Course	450 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 creating requirement specifications and detailed design documents.
- Describe the process of designing circuit and PCB layout for the IoT system.
- Demonstrate the process of building and testing the complete IoT system.
- Explain the importance of working effectively at the workplace.
- Demonstrate various practices to be followed to maintain health and safety at work.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Recommended)	On-the-Job Training Duration (Mandatory)	Total Duration
ELE/N1424: Prepare detailed requirements and design specification documents	**36:00**	**54:00**	**00:00**	**60:00**	**150:00**
Module 1: Process of creating requirement specifications and detailed design documents	36:00	54:00	00:00	60:00	150:00
ELE/N1425: Develop the circuit schematic and PCB layout for the IoT system.	**30:00**	**60:00**	**00:00**	**30:00**	**120:00**
Module 2: Process of designing circuit and PCB layout for the IoT system	30:00	60:00	00:00	30:00	120:00
ELE/N1426: Assemble and perform testing of the complete IoT solution	**30:00**	**30:00**	**00:00**	**60:00**	**120:00**

Module 3: Process of building and testing the complete IoT system	30:00	30:00	00:00	60:00	120:00
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	**120:00**	**180:00**	**00:00**	**150:00**	**450:00**

Module Details

Module 1: Process of creating requirement specifications and detailed design documents

Mapped to ELE/N1424

Terminal Outcomes:

- Describe the process of preparing documents highlighting the requirements and system specifications.
- Describe the process of creating a detailed design document.

Duration: 36:00	Duration: 54:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Identify the high-level design and connectivity requirements for meeting the system needs • Illustrate the need and requirement for inter-operability between various connectivity interfaces. • Identify the protocols that facilitate the handshakes between different connected devices in the IoT system • Identify the manufacturing processes involved and the integration requirement of the entire system. • List all equipment needed for validation and testing of the system • Identify the critical stages and any process constraints depending on the solution. • Identify the trigger mechanisms for every component of the system • Identify and recommend potential security requirements during requirements analysis phase and functional specifications of each components and of the whole system • Identify possible solutions for the IoT system which have been developed by performing alternative design analysis and technical evaluation	• Prepare the M2M information in a flow chart or a connected diagram depicting inputs and the outputs of the system • Apply safety and security measures in all the stages of the design • Prepare a summary of the requirement specifications alongwith the variables to be recorded, need for specific connectivity at eachinterface, etc. • Prepare design as per accepted regulatory standards for the technical specifications and get client's approval on the requirement specification • Use the reusable components, relevant best practices and design standards from the organization's knowledge base • Assess the feasible IoT solutions which will work within the constraints and their technical requirements • Develop strategies for energy efficiency, environmental standards and safety measures

• List appropriate components to be deployed in the IoT system • List standard tools to simulate, analyse and synthesize design options for electronic circuits • Identify noise and electromagnetic interface and electromagnetic compatibility requirements in electrical and electronic systems	

Classroom Aids
Training kit (Trainer guide, Presentations). Whiteboard, Marker, projector, laptop

Tools, Equipment and Other Requirements
Basic Electronics Components like – Transistor, Resistor, Capacitor, Inductor, Tuner, Transformer, Multi-meter Bare PCB & PCBA, LCD, SIM Slot, Vibrator, Memory Card Slot, Camera, Speaker, Mike, Sensors, Connectors and Lens

Module 2: Process of designing circuit and PCB layout for the IoT system

Mapped to ELE/N1425

Terminal Outcomes:

- Demonstrate the process of developing a design for the hardware system.
- Demonstrate the process of building a prototype.
- Demonstrate the process of testing the functionality and usability of the prototype.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Identify the microcontroller (or microprocessor) with the desired specification to meet the processing requirements of the application • Identify the right connectivity modules and other components as per requirement specification • Identify proper power supply mechanisms and calculate voltages and connect appropriate power sources • Identify design requirements and functions of each components • Identify memory, storage design, programming language • Select alternate solutions after assessing each solution as per regulatory standards • Illustrate PCB Stack up and impedance matching requirements	• Prepare the design for all components based on input and output requirements • Design the circuit flow of the system and get a look and feel of the entire system • Prepare the work schedule to be followed for the development of the project • Prepare components requirement list as per technical and cost requirement • Perform what-if analysis based on simulated time and noise number • Evaluate the connectivity between each component • Develop a prototype and test • Demonstrate schematics entry using standard tools after finalizing the prototype • Prepare specifications for PCB Placement and routing guidelines to pass it to PCB CAD designer • Develop the final design specification that fits the requirements of the client, and a final BOM
Classroom Aids	
Training kit (Trainer guide, Presentations). Whiteboard, Marker, projector, laptop	
Tools, Equipment and Other Requirements	
Development Kits (DKs), Evaluation Kits (EVKs), and Mass Production Modules (MPMs)	

Module 3: Process of building and testing the complete IoT system

Mapped to ELE/N1426

Terminal Outcomes:

- Demonstrate the process of building the IoT system.
- Demonstrate the process of configuring and testing the system.
- Demonstrate the process of validating the system correctness against specifications.

Duration: 30:00	**Duration: 30:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Identify the manufacturing technology to build the system and its components • Apply root cause analysis to identify the cause of the problem if test results are in disagreement with specifications	• Check functionality of each component, probing points location to document them • Assemble the various components • Set up the PCB for testing in a test apparatus comprising of test and measurement equipment and measure input and output points • Use different analysis tools such as signal integrity tools, reliability analysis tools and test and measurement equipment • Perform all tests, review and fix the system and document the test results • Check for compliance aftercomparing test results withspecifications • Perform RF performance characterization and tuning for boards with RF interfaces, RF network analysis and problem solving • Demonstrate debugging and trouble shooting and correct any defects • Assess different combinations possible to be used in various intended applications by configuring the system
Classroom Aids	
Training kit (Trainer guide, Presentations)	
Tools, Equipment and Other Requirements	

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 6: On-the-Job Training

Mapped to IoT Hardware Analyst

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

Terminal Outcomes

1. Explain the manufacturing processes involved and the integration requirement of the entire system.
2. Prepare the M2M information in a flow chart or a connected diagram depicting inputs and the outputs of the system.
3. Prepare a summary of the requirement specifications along with the variables to be recorded, need for specific connectivity at each interface, etc.
4. Design the circuit flow of the system and get a look and feel of the entire system.
5. Demonstrate schematics entry using standard tools after finalizing the prototype.
6. Perform what-if analysis based on simulated time and noise number.
7. Perform all tests, review and fix the system and document the test results.
8. Employ appropriate practices to interact and coordinate with supervisor and colleagues.
9. Perform assigned work within the turnaround time and as per the defined quality standards.
10. Demonstrate how to 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/ Degree/ Certified in relevant CITS Trade	Electrical/ Electronics/ Mechanical	2	Semiconductor, Components Manufacturing	1	Electronics & Semiconductors Manufacturing	

Trainer Certification	
Domain Certification	**Platform Certification**
"IoT Hardware Analyst", "ELE/Q1405, v4.0**",** Minimum accepted score is 80%	Recommended that the Trainer is certified for the **IoT Hardware Analyst** "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/ Degree/ certified in relevant CITS Trade	Electrical/ Electronics/ Mechanical	3	Semiconductor, Components Manufacturing	1	Electronics & Semiconductors Manufacturing	

Assessor Certification	
Domain Certification	**Platform Certification**
"IoT Hardware Analyst", "ELE/Q1405, v4.0**",** Minimum accepted score is 80%	Recommended that the Assessor is certified for the **IoT Hardware Analyst** "Assessor (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2701, V2.0", with minimum score of 80%

Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
    - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
    - The assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records
2. Testing Environment

    To ensure a conducive environment for conducting a test, the trainer will:
    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training.
    - Check the Assessment Start and End time to be 10 a.m. and 5 p.m. respectively
    - Ensure there are 2 Assessors if the batch size is more than 30.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
    - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
    - Check the availability of the Lab Equipment for the particular Job Role.
3. Assessment Quality Assurance levels / Framework:
    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with NOS and PC
    - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - The assessor must be ToA certified and the trainer must be ToT Certified
    - The assessment agency must follow the assessment guidelines to conduct the assessment
4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Centre photographs with signboards and scheme-specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
5. Method of verification or validation:

    To verify the details submitted by the training centre, the assessor will undertake:
    - A surprise visit to the assessment location
    - A random audit of the batch
    - A random audit of any candidate
6. Method for assessment documentation, archiving, and access

    To protect the assessment papers and information, the assessor will ensure:
    - Hard copies of the documents are stored

- Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored on the Hard drive

References

Glossary

Term	Description
Declarative knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do **upon the completion of the training**.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do **upon the completion of a module.** A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
DC	Direct Current
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