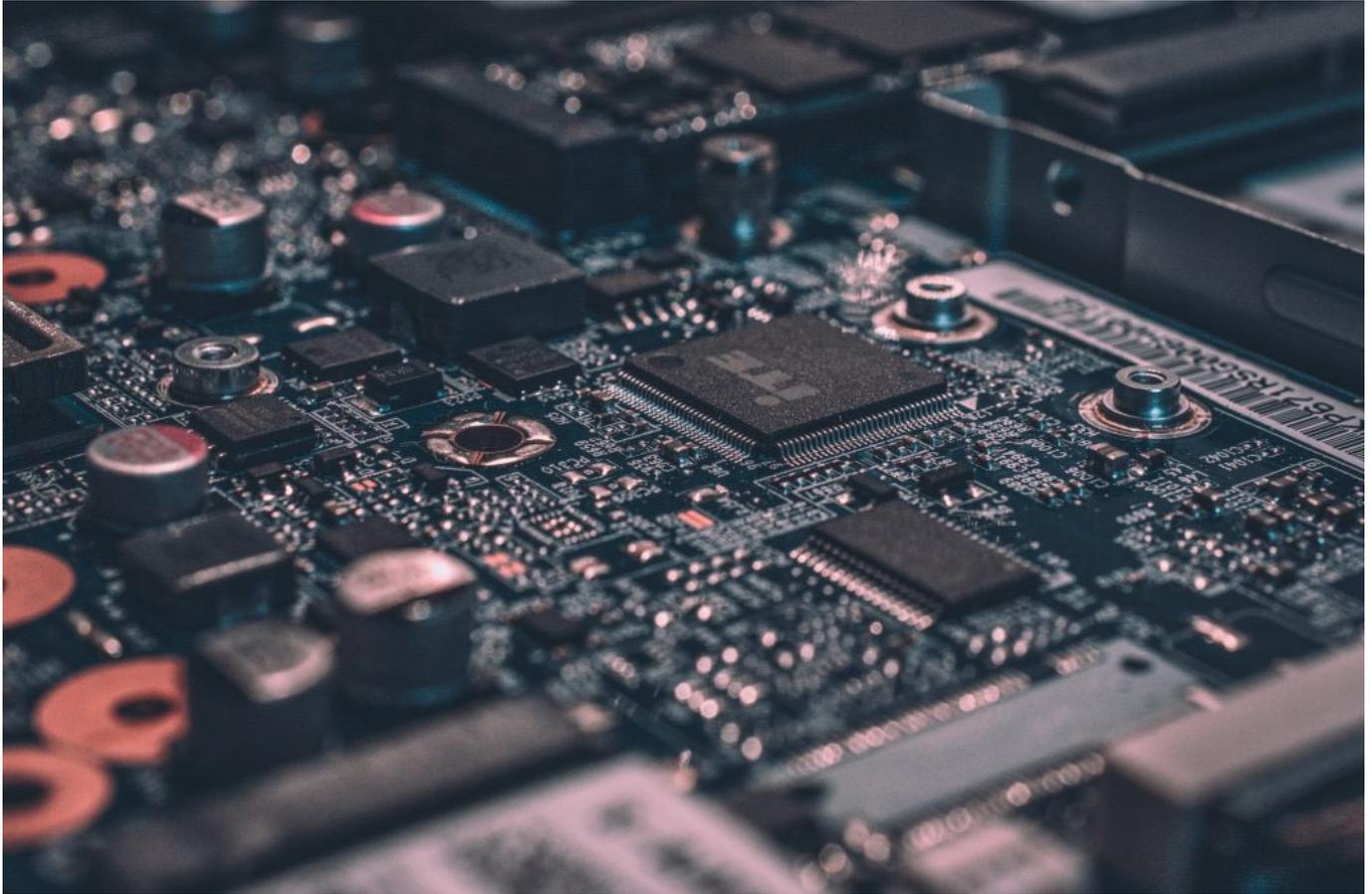




Qualification Pack



IoT Hardware Analyst

QP Code: ELE/Q1405

Version: 2.0

NSQF Level: 5

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House Okhla Industrial Area-Phase 3
New Delhi- 110020 || email:standards@essc-india.org



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ELE/Q1405: IoT Hardware Analyst

Brief Job Description

The individual in this job role prepares a complete blueprint of the hardware including schematics layout, quality verification requirements and perform PCB testing in compliance with regulatory standards to records them in a design document. The individual will also be responsible for working and efficient functioning of the system.

Personal Attributes

The individual must have attention to details, logical thinking, and ability to execute the project as per clients requirement. This job requires the individual to work collaboratively with diverse teams. The individual should be able to hold interest in technology changes, demonstrate strong technical expertise and possess good oral and written communications skills. The individual should also be comfortable working with deadlines and budgets.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ELE/N1407: Create requirement specifications and detailed design documents](#)
2. [ELE/N1408: Design circuit and PCB layout for the IoT system](#)
3. [ELE/N1409: Build and test the complete IoT system](#)
4. [ELE/N9905: Work effectively at the workplace](#)
5. [ELE/N1002: Apply health and safety practices at the workplace](#)

Qualification Pack (QP) Parameters

Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Product Design
Country	India
NSQF Level	5
Credits	NA



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Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification & Experience	Diploma ((Electrical or Electronics Engineering) with 2 Years of Relevant experience)) OR B.E./B.Tech (Degree in Electrical or Electronics Engineering) OR Certificate-NSQF (Level-4 in Design Engineer) with 2 Years of experience In the relevant field
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	Training in Schematic Entry tools like Orcad, PCB Layout tools like PADS, Allegro and Power Integrity and Signal Integrity analysis tools like HyperLynx is desirable
Minimum Job Entry Age	21 Years
Last Reviewed On	27/01/2022
Next Review Date	02/06/2025
Deactivation Date	02/06/2025
NSQC Approval Date	27/01/2022
Version	2.0
Reference code on NQR	2022/EHW/ESSCI/05131
NQR Version	1.0

Qualification Pack

ELE/N1407: Create requirement specifications and detailed design documents

Description

This OS unit is specifically designed to prepare detailed requirement specifications for the IoT systems and a detail design document that entails the specifications of key components, any dependencies and constraints in the system.

Scope

The scope covers the following :

- Prepare documents highlighting the requirements and system specifications
- Create a detailed design document

Elements and Performance Criteria

Prepare documents highlighting the requirements and system specifications

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

- PC1.** verify the high-level design and connectivity requirements with the system needs
- PC2.** ensure that the need and requirement for inter-operability between various connectivity interfaces is maintained
- PC3.** list the protocols that facilitate the handshakes between different connected devices in the IoT system
- PC4.** review all the machine-to-machine (M2M) information in flow chart or connected diagrams that show all inputs and outputs of the system
- PC5.** manage the manufacturing processes involved and the integration requirements of the system to ensure all equipment needed for validation and testing the system is available
- PC6.** check and list the dependencies of critical stages and any process constraints for the system
- PC7.** verify that the trigger mechanisms for every component of the system are highlighted and managed properly
- PC8.** list the safety and security aspects of the system required in all the stages of the design
- PC9.** ensure that globally accepted regulatory standards for the technical specifications have been considered while listing specifications and system requirements
- PC10.** supervise the finalization of requirements and specifications along with other determinants required for proper design and development such as parameters to be recorded, specific connectivity need at each interface, etc.
- PC11.** ensure potential safety requirements have been considered in the analysis phase and customer approval has been received on the requirement specifications

Create a detailed design document

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

- PC12.** review the functional specifications document of the complete system as well as individual components



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- PC13.** ensure that an alternative design analysis has been prepared which describes all possible options/solutions for the requirements specifications
- PC14.** verify that the IoT system matches the technical specifications and confirms with the evaluation criteria and appropriate components to be deployed
- PC15.** ensure that reusable components, relevant best practices and design standards have been used and followed as per the organization's knowledge base
- PC16.** prepare for the component and human resources requirements from various domains such as chip design (if any), board design, layout designers, connectivity protocol experts, firm ware designers, verification and validation folks, etc.
- PC17.** check standard tools to simulate, analyse and synthesize design options for electronic circuits
- PC18.** ensure that the designed system matches quality standards and user requirements
- PC19.** review strategies used by the designed system for energy efficiency, environmental standards and safety measures
- PC20.** check noise and electromagnetic interface (EMI) and electromagnetic compatibility (EMC) requirements in electrical and electronic systems
- PC21.** guide initial assessment of the entire system while outlining the possible delivery output with the client and seek their approval

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, rules and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the work place
- KU3.** own job role and responsibilities
- KU4.** sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU5.** reporting structure, inter-department functions, lines and procedures in the work area
- KU6.** how to engage with experts and vendors for support
- KU7.** relevant people and their responsibilities within the work area
- KU8.** documentation and related procedures applicable in the context of the employment and work
- KU9.** escalation matrix and procedures for reporting work and employment related issues
- KU10.** safety and cleanliness procedures to be adopted in the workplace
- KU11.** importance of document preparation, referencing and flow chart preparation
- KU12.** document control: using organizational document naming and numbering schemes
- KU13.** use of project management tools like microsoft project and jira
- KU14.** reading and drawing electronic circuits, process and system flowcharts, project schedules, logic diagram and work breakdown structures (wbs)
- KU15.** principles of electrical and electronics engineering
- KU16.** types of sensors and micro- controllers and their accuracy, types, uses and precautions

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- KU17.** concepts of digital electronics, communication protocols and wireless standards like bluetooth, wlan, cellular standards like gprs, 3g/4g/5g and narrow-band iot
- KU18.** frequencies of operation, range, power requirements, modules/chips to support these standards and the related design considerations
- KU19.** estimation of system power budget
- KU20.** identification of various sources of power, connection design of power supply system and their use in the iot system
- KU21.** various iot cloud platforms and build an overall understanding of solution requirements
- KU22.** noise and emi sources in electronics circuits
- KU23.** different types of batteries, their size calculation and methods of battery charging
- KU24.** application of uninterrupted ac power sources, if the system runs on non-mains power
- KU25.** basics of rf board design, high speed digital design, schematic entry tools, pcb cad tools, pcb power and signal integrity analysis tools
- KU26.** pcb layout process: defining board stackup, impedance matching requirements, specifying placement and routing guidelines
- KU27.** importance of any automation plan, project implementation and change management
- KU28.** applicable standards, regulations, code compliance
- KU29.** how to ensure the design confirms to safety and environmental standards

Generic Skills (GS)

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

- GS1.** how to fill up appropriate technical forms, process charts, activity logs as per organizational format in english and/or local language
- GS2.** methods to capture complete information as required from stakeholders, experts, vendors, etc. accurately and in the required formats
- GS3.** process of preparation of report summarizing all the relevant information
- GS4.** use of basic office applications like spread sheet, word processor, presentations
- GS5.** use of organizational software specific to quality function
- GS6.** how to write an email to communicate within and outside the organization as per organization guidelines
- GS7.** how to prepare and create flow charts and use of project planning tools
- GS8.** how to read/listen and interpret information correctly from various work instruction documents, manuals, health and safety instructions, memos, etc. applicable to the job in english and/or local language
- GS9.** how to read relevant symbols, labels and descriptions on components and equipment while performing early analysis of design
- GS10.** methods to gather information in an organized manner such that all relevant information is obtained
- GS11.** use of probing questions to help the stakeholders provide complete information
- GS12.** how to convey and share technical information clearly using appropriate business and technical language
- GS13.** how to check and clarify task-related information

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- GS14.** how to liaise with appropriate authorities using correct protocol
- GS15.** how to communicate with people following organizational protocols
- GS16.** how to take inputs from various stakeholders in order to make critical decisions
- GS17.** methods of evaluating various options, their pros and cons, short term and long-term implications, cost, time and scope implications, health and safety implications, etc.
- GS18.** process of seeking clarification from responsible authority on how to rectify problems at work
- GS19.** how to identify limitations and constraints of any components being used in the system
- GS20.** how to plan, prioritize and sequence the activities to be carried out
- GS21.** how to organize and analyze information relevant to work
- GS22.** how to maintain productivity by applying time management, efficient resource utilization and eliminating waste and extra cost in the design
- GS23.** how to communicate with customers on regular basis updating them on project status, delivery schedules, deviations or variances in any project specifications like schedule, development cost, product cost, feature changes etc.
- GS24.** how to establish agreed format and timelines for customer mails/ meetings/updates.
- GS25.** how to establish the format and approach for the integration of the design into the customer system
- GS26.** methods to generate a structured problem statement and plan for problem solving as per priority
- GS27.** process of identifying problems with work planning, procedures, output and behavior and their implications
- GS28.** how to identify sources of information and support for solving a problem
- GS29.** how to seek assistance and support from relevant authority in case of unresolved problems
- GS30.** how to apply effective problem resolutions techniques appropriately
- GS31.** how to monitor effectiveness of problem resolution through appropriate feedback mechanisms
- GS32.** how to apply logical reasoning to solve problems related to work by analyzing them based on previous experiences
- GS33.** how to determine the impact of selection of inappropriate work procedures and inputs on overall work outcome

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Prepare documents highlighting the requirements and system specifications</i>	22	26	-	5
PC1. verify the high-level design and connectivity requirements with the system needs	2	3	-	1
PC2. ensure that the need and requirement for inter-operability between various connectivity interfaces is maintained	2	2	-	-
PC3. list the protocols that facilitate the handshakes between different connected devices in the IoT system	2	2	-	-
PC4. review all the machine-to-machine (M2M) information in flow chart or connected diagrams that show all inputs and outputs of the system	2	3	-	1
PC5. manage the manufacturing processes involved and the integration requirements of the system to ensure all equipment needed for validation and testing the system is available	2	2	-	1
PC6. check and list the dependencies of critical stages and any process constraints for the system	2	2	-	-
PC7. verify that the trigger mechanisms for every component of the system are highlighted and managed properly	2	2	-	1
PC8. list the safety and security aspects of the system required in all the stages of the design	2	2	-	1
PC9. ensure that globally accepted regulatory standards for the technical specifications have been considered while listing specifications and system requirements	2	3	-	-
PC10. supervise the finalization of requirements and specifications along with other determinants required for proper design and development such as parameters to be recorded, specific connectivity need at each interface, etc.	2	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. ensure potential safety requirements have been considered in the analysis phase and customer approval has been received on the requirement specifications	2	3	-	-
<i>Create a detailed design document</i>	18	24	-	5
PC12. review the functional specifications document of the complete system as well as individual components	2	3	-	1
PC13. ensure that an alternative design analysis has been prepared which describes all possible options/solutions for the requirements specifications	2	3	-	1
PC14. verify that the IoT system matches the technical specifications and confirms with the evaluation criteria and appropriate components to be deployed	2	2	-	1
PC15. ensure that reusable components, relevant best practices and design standards have been used and followed as per the organization's knowledge base	2	2	-	-
PC16. prepare for the component and human resources requirements from various domains such as chip design (if any), board design, layout designers, connectivity protocol experts, firm ware designers, verification and validation folks, etc.	2	2	-	-
PC17. check standard tools to simulate, analyse and synthesize design options for electronic circuits	2	2	-	-
PC18. ensure that the designed system matches quality standards and user requirements	2	3	-	-
PC19. review strategies used by the designed system for energy efficiency, environmental standards and safety measures	2	2	-	1
PC20. check noise and electromagnetic interface (EMI) and electromagnetic compatibility (EMC) requirements in electrical and electronic systems	1	2	-	1
PC21. guide initial assessment of the entire system while outlining the possible delivery output with the client and seek their approval	1	3	-	-



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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	40	50	-	10



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National Occupational Standards (NOS) Parameters

NOS Code	ELE/N1407
NOS Name	Create requirement specifications and detailed design documents
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Product Design
NSQF Level	5
Credits	TBD
Version	2.0
Last Reviewed Date	27/01/2022
Next Review Date	03/05/2026
NSQC Clearance Date	03/05/2023

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ELE/N1408: Design circuit and PCB layout for the IoT system

Description

This OS unit is specifically designed to prepare learners with the required learning outcomes needed to design an IoT system and achieve desired results.

Scope

The scope covers the following :

- Develop a design for the hardware system
- Build a prototype
- Test the functionality and usability of the prototype

Elements and Performance Criteria

Develop a design for the hardware system

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

- PC1.** verify prescribed safety guidelines and check microcontroller (or microprocessor) with the desired Read Only Memory (ROM) and frequency to meet the processing requirements of the application
- PC2.** check that the pin configurations for all components based on input and output requirements have been met
- PC3.** review the right connectivity modules and other components as per requirement specifications

Build a prototype

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

- PC4.** test voltage and connect appropriate power source to supply mechanisms and associate capacitors for proper power delivery
- PC5.** check all connectivity interfaces required between the components of the system, both wired and wireless (short range and long range)
- PC6.** verify that each component functions as per the design requirements for the system
- PC7.** guide the team to follow the work schedule and plan using project management principles and tools, and allocate appropriate resources
- PC8.** supervise the working of the team to ensure that appropriate components meet technical and cost requirements of the system and correct connectivity methods between components has been used
- PC9.** test the prototype for simulated time and noise numbers (for the entire path) and perform what-if analysis to optimize the system

Test the functionality and usability of the prototype

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

- PC10.** monitor the desired connectivity between each component, how they actually interact with each other and verify triggering events

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- PC11.** review the memory and storage devices involved in the prototype to ensure that proper programming languages (Embedded C, Assembly code, etc.) have been used and optimum connectivity between the pre-defined pins of the input and output devices is maintained
- PC12.** verify the prototype and perform a pilot run of the entire system in the simulated client environment
- PC13.** guide alternate solutions based on optimization techniques and perform minor revisions through what-if scenarios and document the pros and cons
- PC14.** check the solutions against the regulatory, safety and environmental standards to choose the right manufacturing method for Printed Circuit Board (PCB) or the chips involved
- PC15.** test one prototype solution (or may be two) and prepare detailed notes of the specifications (dimensions, functional, constraints)
- PC16.** review the final design specification that fits the requirements of the client and a final Bill of Material (BOM)
- PC17.** check the schematics entry using standard tools to identify the Printed Circuit board (PCB) Stackup, PCB placement, routing guidelines to PCB Computer Aided Design (CAD) designer and impedance matching requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the work place
- KU3.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU4.** reporting structure, inter-department functions, lines and procedures in the work area
- KU5.** how to engage with specialists for support in order to resolve change requests or fixing deviations in design
- KU6.** importance of working in clean and safe environment practices and procedures
- KU7.** the quality processes and guidelines of the organization/customer
- KU8.** relevant people and their responsibilities within the work area
- KU9.** documentation and related procedures applicable in the context of employment and work
- KU10.** escalation matrix and procedures for reporting work and employment related issues
- KU11.** basic fundamentals of units, measurement and dimensions
- KU12.** how to carry out error and uncertainty analysis
- KU13.** how to read and interpret simulated measurement numbers to make inferences
- KU14.** process of analog to digital conversions and vice-versa
- KU15.** how to use and apply sensors (light, sound touch, temperature etc.), micro controllers (arm etc.) and microprocessors
- KU16.** basic architecture structure of a micro controller or a microprocessor (interrupts, cpu, rom, bus control, io ports etc.) and interpreting their pin configuration
- KU17.** application of digital signal processing principles

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- KU18.** types of wired and wireless standards and a good understanding of their protocols from an OSI layer perspective for proper hardware implementation
- KU19.** appropriate use of communication protocols such as UART, SPI, RS32 etc.
- KU20.** different components used in electronic circuitry and their applications (like LEDs, resistors, capacitors, etc.).
- KU21.** how to choose microcontroller interface techniques and how to interface them to other devices
- KU22.** how to write firmware for input and output devices in C or assembly language
- KU23.** optimization of BOM to minimize product cost and ensure multi-sourcing

Generic Skills (GS)

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

- GS1.** how to write emails to customers or other staff in form of business communication
- GS2.** how to fill up appropriate forms, activity logs, attendance sheets as per organizational format in English and/or local language
- GS3.** how to read/listen and interpret information correctly from various work instruction documents, manuals, health and safety instructions, memos, etc. applicable to the job in English and/or local language
- GS4.** how to read relevant symbols, labels or descriptions on components and equipment while performing system operation
- GS5.** methods to convey and share technical information clearly using appropriate language and terminology
- GS6.** process to check and clarify task-related information
- GS7.** how to liaise with appropriate authorities using correct protocol
- GS8.** how to communicate with people in respectful manner following organizational protocol
- GS9.** how to seek clarification from responsible authority on how to rectify problems at work
- GS10.** how to identify errors and defects in components as they fail to work in the system and take remedial actions or a work around on the design
- GS11.** how to plan, prioritize and sequence work operations as per job requirements
- GS12.** how to organize and analyze information relevant to work
- GS13.** how to maintain productivity by applying time management, efficient resource utilization and eliminating waste and extra cost in the design
- GS14.** how to involve the customer at various milestones of the design to keep them abreast on the progress and to seek their approval
- GS15.** how to update the customer through appropriate forum/communication methodology agreed beforehand
- GS16.** how to generate a structured problem statement and plan for problem solving as per priority
- GS17.** methods to identify problems with work planning, procedures, output and behaviour and their implications
- GS18.** methods to identify sources of information and support for solving a problem
- GS19.** how to seek assistance and support from relevant authority in case of unresolved problems
- GS20.** how to apply effective problem resolutions techniques appropriately



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- GS21.** how to monitor effectiveness of problem resolution through appropriate feedback mechanisms
- GS22.** how to apply logical reasoning to solve problems related to work based on previous experiences
- GS23.** how to determine the impact of selection of inappropriate work procedures and inputs on overall work outcome

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Develop a design for the hardware system</i>	9	10	-	6
PC1. verify prescribed safety guidelines and check microcontroller (or microprocessor) with the desired Read Only Memory (ROM) and frequency to meet the processing requirements of the application	3	3	-	2
PC2. check that the pin configurations for all components based on input and output requirements have been met	3	4	-	2
PC3. review the right connectivity modules and other components as per requirement specifications	3	3	-	2
<i>Build a prototype</i>	15	17	-	4
PC4. test voltage and connect appropriate power source to supply mechanisms and associate capacitors for proper power delivery	3	3	-	1
PC5. check all connectivity interfaces required between the components of the system, both wired and wireless (short range and long range)	3	3	-	-
PC6. verify that each component functions as per the design requirements for the system	3	3	-	1
PC7. guide the team to follow the work schedule and plan using project management principles and tools, and allocate appropriate resources	2	3	-	1
PC8. supervise the working of the team to ensure that appropriate components meet technical and cost requirements of the system and correct connectivity methods between components has been used	2	2	-	1
PC9. test the prototype for simulated time and noise numbers (for the entire path) and perform what-if analysis to optimize the system	2	3	-	-
<i>Test the functionality and usability of the prototype</i>	16	23	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. monitor the desired connectivity between each component, how they actually interact with each other and verify triggering events	2	3	-	-
PC11. review the memory and storage devices involved in the prototype to ensure that proper programming languages (Embedded C, Assembly code, etc.) have been used and optimum connectivity between the pre-defined pins of the input and output devices is maintained	2	3	-	-
PC12. verify the prototype and perform a pilot run of the entire system in the simulated client environment	2	3	-	-
PC13. guide alternate solutions based on optimization techniques and perform minor revisions through what-if scenarios and document the pros and cons	2	3	-	-
PC14. check the solutions against the regulatory, safety and environmental standards to choose the right manufacturing method for Printed Circuit Board (PCB) or the chips involved	2	3	-	-
PC15. test one prototype solution (or may be two) and prepare detailed notes of the specifications (dimensions, functional, constraints)	2	3	-	-
PC16. review the final design specification that fits the requirements of the client and a final Bill of Material (BOM)	2	3	-	-
PC17. check the schematics entry using standard tools to identify the Printed Circuit board (PCB) Stackup, PCB placement, outing guidelines to PCB Computer Aided Design (CAD) designer and impedance matching requirements	2	2	-	-
NOS Total	40	50	-	10



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National Occupational Standards (NOS) Parameters

NOS Code	ELE/N1408
NOS Name	Design circuit and PCB layout for the IoT system
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Product Design
NSQF Level	5
Credits	TBD
Version	2.0
Last Reviewed Date	27/01/2022
Next Review Date	03/05/2026
NSQC Clearance Date	03/05/2023

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ELE/N1409: Build and test the complete IoT system

Description

This OS unit is specifically designed to prepare learners with the required learning outcomes needed to build, test, configure and validate the IoT system.

Scope

The scope covers the following :

- Build the IoT system
- Configure and test the system
- Validate the system correctness against specifications

Elements and Performance Criteria

Build the IoT system

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

- PC1.** verify that the appropriate manufacturing technology is used to build the system (PCBs and the ICs) for required components as well as their functionality
- PC2.** ensure all components needed for the system have probing points in the design and their specifications have been documented
- PC3.** test the PCB in a test apparatus comprising of test and measurement equipment including oscilloscopes, multimeter(s), signal generator(s), protocol tester(s) etc.

Configure and test the system

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

- PC4.** check that all the required input and output points at every part of the system are properly functioning using the right trigger (for a desired set of inputs, there should be a desired set of outputs)
- PC5.** verify that different type of tests, review, fix system accordingly are used for system testing and check the test results
- PC6.** troubleshoot the system for any anomalies and correct the defects in the design, if any
- PC7.** test the system for various intended applications by selecting different possible combinations

Validate the system correctness against specifications

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

- PC8.** observe and interpret test results against specifications and check for compliance against the specifications
- PC9.** review Radio Frequency (RF) performance characterization as well as RF performing tuning for boards with RF interfaces, including power amplifier (PA) and low noise amplifier (LNA) tuning, RF network analysis and problem solving
- PC10.** perform root cause analysis to identify the cause of the problem, if any, or if test results are in disagreement with specifications
- PC11.** review changes to the specifications or to the tested design and finalize the system



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Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** relevant legislation, standards, policies, rules and procedures followed in the company relevant to own employment and performance conditions
- KU2.** relevant health and safety requirements applicable in the work place
- KU3.** own job role and responsibilities and sources for information pertaining to employment terms, entitlements, job role and responsibilities
- KU4.** reporting structure, inter-department functions, lines and procedures in the work area
- KU5.** how to engage with specialists for support and correct any deviations to the design specifications
- KU6.** importance of working in clean and safe environment practices and procedures
- KU7.** relevant people and their responsibilities within the work place
- KU8.** escalation matrix and procedures for reporting work and employment related issues
- KU9.** how to read si units and measurement
- KU10.** application of terms such as range, linearity, and sensitivity
- KU11.** how to read analog and digital meters
- KU12.** meaning of dynamic measurement and response factor
- KU13.** application of sensors and microcontrollers
- KU14.** principles of digital signal processing for measurement
- KU15.** how to prepare block diagram model and feedback control systems
- KU16.** how to identify sensors and actuating instruments
- KU17.** principles of digital control and sampled data systems
- KU18.** different wireless data transmission for iot applications
- KU19.** project principles methodology and use of project planning tools
- KU20.** application and method of soldering
- KU21.** electronics and electrical engineering principles
- KU22.** different test and measurement equipment such as spectrum analyser, oscilloscope, signal generator, multimeter etc.
- KU23.** design component selection and block diagram generation
- KU24.** schematic entry tools from different vendors like cadence, mentor graphics etc.
- KU25.** signal integrity tools such as mentor graphics hyperlynx
- KU26.** reliability analysis tools for mtbf calculation
- KU27.** layout checking, bom generation process, design for testability (dft), design for manufacturability (dfm) techniques
- KU28.** board bring-up sequence, how to define test cases for production boards
- KU29.** how to consider both functional and non-functional (ex: scalability) of the overall iot solution while designing test cases
- KU30.** environmental ruggedization aspects, conformal coating
- KU31.** PCB and IC manufacturing process, fabrication drawings and assembly process

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- KU32.** design constraints and complete design cycle from understanding customers specifications to production
- KU33.** quality standards associated with pcb and ic design
- KU34.** installing and configuring operating systems (linux, windows), storage subsystems
- KU35.** servers, storage hardware, hardware design, testing, verification and validation
- KU36.** procedure to recommend/make changes to the design
- KU37.** research sources for obtaining technical information
- KU38.** statutory regulations, standards and codes of practice and their implications
- KU39.** importance of keeping designs developed confidential and consequences of breaching ipr clause

Generic Skills (GS)

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

- GS1.** how to fill up appropriate forms, activity logs, attendance sheets as per organizational format in english and/or local language
- GS2.** how to write an email to communicate within and outside the organization as per organization guidelines
- GS3.** how to read/listen and interpret information correctly from various work instruction documents, manuals, health and safety instructions, memos, etc. applicable to the job in english and/or local language
- GS4.** how to read relevant symbols, labels or descriptions on components and equipment while designing an iot system
- GS5.** how to read schematics, blueprints, product and customer specifications
- GS6.** methods to convey and share technical information clearly
- GS7.** process to check and clarify task-related information
- GS8.** how to liaise with appropriate authorities using correct protocol
- GS9.** how to communicate with people in respectful manner in line with organizational protocol
- GS10.** how to communicate with external pcb and chip manufacturers
- GS11.** how to communicate with customer in order to resolve any discrepancies in the design for manufacture aspect
- GS12.** how to coordinate with various departments such as marketing, sales, production, research and development
- GS13.** how to work in teams to devise creative solutions
- GS14.** how to plan and organize own tasks
- GS15.** how to multi-task, handle additional responsibility and adapt quickly to changing priorities
- GS16.** how to deal with difficult situations and make decisions
- GS17.** how to seek clarification from immediate supervisor/responsible authority, if required
- GS18.** how to identify and document faults/defects in components
- GS19.** how to plan, prioritize and sequence work operations as per requirement
- GS20.** how to organize and analyze information relevant to work



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- GS21.** how to maintain productivity by applying time management, efficient resource utilization and eliminating waste and extra cost in the design
- GS22.** how to focus on customers requirement
- GS23.** how to respond to customer queries in a timely and appropriate manner
- GS24.** how to troubleshoot the errors in the system
- GS25.** how to communicate problems appropriately to others and propose solutions
- GS26.** how to identify sources of information and support for problem solving
- GS27.** how to seek assistance and support from other sources to solve problems
- GS28.** how to apply effective resolution techniques
- GS29.** how to monitor effectiveness of problem resolution through appropriate feedback mechanisms
- GS30.** how to apply logical reasoning to solve problems related to work based on experience
- GS31.** how to determine the impact of selection of inappropriate work procedures and inputs on overall work outcome
- GS32.** how to spot process and system disruptions and delays
- GS33.** how to demonstrate leadership in cad system, library management and design release process for high-volume as well as low-volume product manufacturing
- GS34.** how to ensure the feasibility of the designs based on known principles on physics, engineering and mathematics
- GS35.** how to suggest corrective actions to reduce repetitive errors
- GS36.** how to recommend and improve work process with less rework within pcb or chip design function
- GS37.** how to use test and measurement equipment like oscilloscopes, pcie protocol analysers, spectrum analyser, signal generators, multimeters etc.
- GS38.** how to use various design tools, equipment, and computer applications and software

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Build the IoT system</i>	12	15	-	3
PC1. verify that the appropriate manufacturing technology is used to build the system (PCBs and the ICs) for required components as well as their functionality	4	5	-	1
PC2. ensure all components needed for the system have probing points in the design and their specifications have been documented	4	5	-	1
PC3. test the PCB in a test apparatus comprising of test and measurement equipment including oscilloscopes, multimeter(s), signal generator(s), protocol tester(s) etc.	4	5	-	1
<i>Configure and test the system</i>	15	19	-	4
PC4. check that all the required input and output points at every part of the system are properly functioning using the right trigger (for a desired set of inputs, there should a desired set of outputs)	4	5	-	1
PC5. verify that different type of tests, review, fix system accordingly are used for system testing and check the test results	4	5	-	1
PC6. troubleshoot the system for any anomalies and correct the defects in the design, if any	3	5	-	1
PC7. test the system for various intended applications by selecting different possible combinations	4	4	-	1
<i>Validate the system correctness against specifications</i>	13	16	-	3
PC8. observe and interpret test results against specifications and check for compliance against the specifications	3	4	-	1

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. review Radio Frequency (RF) performance characterization as well as RF performing tuning for boards with RF interfaces, including power amplifier (PA) and low noise amplifier (LNA) tuning, RF network analysis and problem solving	3	4	-	1
PC10. perform root cause analysis to identify the cause of the problem, if any, or if test results are in disagreement with specifications	4	4	-	1
PC11. review changes to the specifications or to the tested design and finalize the system	3	4	-	-
NOS Total	40	50	-	10



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National Occupational Standards (NOS) Parameters

NOS Code	ELE/N1409
NOS Name	Build and test the complete IoT system
Sector	Electronics
Sub-Sector	Semiconductor & Components
Occupation	Product Design
NSQF Level	5
Credits	TBD
Version	2.0
Last Reviewed Date	27/01/2022
Next Review Date	03/05/2026
NSQC Clearance Date	03/05/2023

Qualification Pack

ELE/N9905: Work effectively at the workplace

Description

This unit is about the communicating and managing work effectively at the workplace as well as taking measures to enhance own competence and working in a disciplined and ethical manner.

Scope

The scope covers the following :

- Communicate effectively at the workplace
- Work effectively
- Maintain and enhance professional competence
- Work in a disciplined and ethical manner
- Uphold social diversity at the workplace

Elements and Performance Criteria

Communicate effectively at the workplace

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

- PC1.** exchange information and instruction with colleagues, and seek clarifications and feedback as necessary
- PC2.** assist colleagues where required
- PC3.** follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)
- PC4.** document and share all relevant information with stakeholders in agreed formats and as per agreed timelines

Work effectively

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

- PC5.** identify and obtain clarity regarding organisational, team and own goals and targets
- PC6.** prioritise and plan work in order to achieve goals and targets
- PC7.** monitor own and team performance as per agreed plan
- PC8.** complete duties accurately, systematically and within required timeframes
- PC9.** express emotions appropriately at the workplace and manage own response to heightened emotions
- PC10.** maintain orderliness and cleanliness in the work area

Maintain and enhance professional competence

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

- PC11.** identify own strengths and weaknesses in relation to goals and targets
- PC12.** adapt self, service, or product to meet success criteria
- PC13.** seek and select opportunities for continuous professional development
- PC14.** formulate a professional development plan to enhance capabilities

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- PC15.** build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations
- PC16.** examine developments and trends in field of work and their potential impact on work
- PC17.** take feedback from peers, supervisors and clients to improve own performance and practices

Work in a disciplined and ethical manner

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

- PC18.** perform tasks as per workplace standards, organisational policies and legislative requirements
- PC19.** display appropriate professional appearance at the workplace and adhere to the organisational dress code
- PC20.** demonstrate responsible and disciplined behaviour at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behaviour at all times, adopting environment- friendly practices, etc.
- PC21.** identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution
- PC22.** protect the rights of the client and organisation when delivering services
- PC23.** ensure services are delivered equally to all clients regardless of personal and cultural beliefs
- PC24.** operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities
- PC25.** follow organisational guidelines and legal requirements on disclosure and confidentiality

Uphold social diversity at the workplace

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

- PC26.** recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes
- PC27.** identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace
- PC28.** use inclusive or neutral language and gestures in all interactions
- PC29.** respect the personal and professional space of others
- PC30.** access grievance redressal mechanisms as per legislations

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** organisation's policies on dress code, workplace timings, workplace behaviour, performance management, incentives, delivery standards, information security, etc.
- KU2.** organizational hierarchy and escalation matrix
- KU3.** importance of the individual's role in the workflow
- KU4.** organisational norms on health, safety and sustainability
- KU5.** work area inspection procedures and practices
- KU6.** professional etiquette and grooming

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- KU7.** communication etiquette across communicative mediums (online, digital, and in-person) including strategies/methods for sharing information, documentation, and providing and receiving feedback
- KU8.** importance of self-evaluations and developing a continuous learning and professional development plan
- KU9.** developments and trends impacting professional practice
- KU10.** importance of taking and using feedback from colleagues and clients to identify and introduce improvements in work performance
- KU11.** professional ethics and workplace norms on reporting and/or penalizing unethical behaviour and practices.
- KU12.** guidelines and legal requirements on disclosure, confidentiality, and conflicts of interest
- KU13.** strategies for collaboration with colleagues and clients.
- KU14.** professional responses and strategies against inappropriate language or behaviour toward self and others
- KU15.** Implicit bias (based on gender, disability, class, caste, colour, race, culture, religion, etc.) and its consequences in the workplace
- KU16.** organizational guidelines, prevalent legislations and accessibility norms and processes to support PwDs at the workplace
- KU17.** strategies for time, effort and resource allocation towards the goals.
- KU18.** basic concepts of work productivity including waste reduction, efficient material usage and optimization of time

Generic Skills (GS)

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

- GS1.** complete documentation and forms such as work orders, invoices maintenance records activity logs, attendance sheets as per organizational format in English and/or local language
- GS2.** write basic accident or incident report accurately in an appropriate format
- GS3.** read warnings, instructions and other text material on product labels, components, etc. and relevant signages, warnings, labels or descriptions on equipment, etc. while carrying out work activities
- GS4.** convey and share technical information clearly using appropriate language
- GS5.** clarify task-related information
- GS6.** liaise with authorities and supervisors as per organizational protocol
- GS7.** listen, speak, and write in an inclusive, respectful manner in line with organizational protocol
- GS8.** seek clarification from immediate supervisor or responsible authority or exercise most appropriate solutions to safety breaches at work
- GS9.** report to the supervisor and when to deal with a colleague depending on the type of concern
- GS10.** deliver product to next work process on time
- GS11.** improve work process and report potential areas of delays and disruptions
- GS12.** communicate problems appropriately to others
- GS13.** identify symptoms of the fault to the cause of the problem and resolve, otherwise seek assistance and support from other sources to solve the problem



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- GS14.** anticipate and avoid hazards that may occur during repairs because of tools, materials used or repair processes
- GS15.** complete tasks efficiently and accurately within stipulated time
- GS16.** appreciate and respect social diversity in all professional settings
- GS17.** develop awareness and accountability for perspectives on gender, disabilities, and socio-cultural issues leading to discrimination, bias, or harassment at the workplace
- GS18.** maintain positive and effective relationships with colleagues and customers

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Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Communicate effectively at the workplace</i>	5	13	-	-
PC1. exchange information and instruction with colleagues, and seek clarifications and feedback as necessary	1	3	-	-
PC2. assist colleagues where required	1	3	-	-
PC3. follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)	1	4	-	-
PC4. document and share all relevant information with stakeholders in agreed formats and as per agreed timelines	2	3	-	-
<i>Work effectively</i>	6	13	-	-
PC5. identify and obtain clarity regarding organisational, team and own goals and targets	1	2	-	-
PC6. prioritise and plan work in order to achieve goals and targets	1	2	-	-
PC7. monitor own and team performance as per agreed plan	1	2	-	-
PC8. complete duties accurately, systematically and within required timeframes	1	2	-	-
PC9. express emotions appropriately at the workplace and manage own response to heightened emotions	1	2	-	-
PC10. maintain orderliness and cleanliness in the work area	1	3	-	-
<i>Maintain and enhance professional competence</i>	8	7	-	-
PC11. identify own strengths and weaknesses in relation to goals and targets	1	1	-	-
PC12. adapt self, service, or product to meet success criteria	1	1	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. seek and select opportunities for continuous professional development	1	1	-	-
PC14. formulate a professional development plan to enhance capabilities	2	1	-	-
PC15. build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations	1	1	-	-
PC16. examine developments and trends in field of work and their potential impact on work	1	1	-	-
PC17. take feedback from peers, supervisors and clients to improve own performance and practices	1	1	-	-
<i>Work in a disciplined and ethical manner</i>	11	16	-	-
PC18. perform tasks as per workplace standards, organisational policies and legislative requirements	2	2	-	-
PC19. display appropriate professional appearance at the workplace and adhere to the organisational dress code	1	2	-	-
PC20. demonstrate responsible and disciplined behaviour at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behaviour at all times, adopting environment- friendly practices, etc.	1	2	-	-
PC21. identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution	2	2	-	-
PC22. protect the rights of the client and organisation when delivering services	1	2	-	-
PC23. ensure services are delivered equally to all clients regardless of personal and cultural beliefs	1	2	-	-
PC24. operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities	2	2	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC25. follow organisational guidelines and legal requirements on disclosure and confidentiality	1	2	-	-
<i>Uphold social diversity at the workplace</i>	10	11	-	-
PC26. recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes	2	2	-	-
PC27. identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace	2	2	-	-
PC28. use inclusive or neutral language and gestures in all interactions	2	2	-	-
PC29. respect the personal and professional space of others	2	2	-	-
PC30. access grievance redressal mechanisms as per legislations	2	3	-	-
NOS Total	40	60	-	-



Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N9905
NOS Name	Work effectively at the workplace
Sector	Electronics
Sub-Sector	Generic
Occupation	Generic - Organizational Behaviour
NSQF Level	4
Credits	TBD
Version	2.0
Last Reviewed Date	24/02/2022
Next Review Date	30/12/2026
NSQF Clearance Date	30/12/2021

Qualification Pack

ELE/N1002: Apply health and safety practices at the workplace

Description

This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace.

Scope

The scope covers the following :

- Deal with workplace hazards
- Apply fire safety practices
- Follow emergencies, rescue and first-aid procedures
- Effective waste management/recycling practices

Elements and Performance Criteria

Deal with workplace hazards

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

- PC1.** identify job-site hazards and possible causes of accident in the workplace
- PC2.** perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc.
- PC3.** use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards
- PC4.** follow standard safety procedures while handling tool/ ,equipment, hazardous substances and while working in hazardous environments
- PC5.** dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques
- PC6.** avoid damage of components due to negligence in electrostatic discharge (ESD) procedures
- PC7.** locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans)
- PC8.** maintain appropriate posture while handling heavy objects
- PC9.** apply good housekeeping practices at all times

Apply fire safety practices

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

- PC10.** take preventive measures to prevent fire hazards
- PC11.**
 - use appropriate fire extinguishers for different types of fires
 - Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no l
- PC12.** exhibit rescue and first-aid techniques in case of fire or electrocution

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Follow emergencies, rescue and first-aid procedures

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

- PC13.** administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc.
- PC14.** administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock,
- PC15.** participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work
- PC16.** use correct method to move injured people and others during an emergency

Effective waste management/recycling practices

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

- PC17.** identify recyclable and non-recyclable, and hazardous waste generated
- PC18.** segregate waste into different categories
- PC19.** ensure disposal of non-recyclable waste appropriately
- PC20.** deposit non-recyclable and reusable material at identified location
- PC21.** follow processes specified for disposal of hazardous waste

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** importance of working in clean and safe work environment following safety practices and procedures
- KU2.** health and safety roles and responsibilities of relevant personnel within and outside the organisation
- KU3.** key internal and external sources of health and safety information
- KU4.** basic knowledge of electronic devices and related health risks
- KU5.** meaning of hazards and risks
- KU6.** various types of health and safety hazards commonly present in the work environment such as physical hazards, electrical hazards, chemical hazards, fire hazards, equipment related hazards, health hazards, etc.
- KU7.** methods of accident prevention
- KU8.** importance of using protective clothing/equipment while working
- KU9.** general principles for identifying and controlling health and safety risks
- KU10.** main hazards and preventive as well as control measures while working with different types of equipment
- KU11.** importance of carrying out electrical and non-electrical isolation to prevent hazards from loss of machine/system/process control
- KU12.** main hazards and preventive as well as control measures when working with electrical systems or using electrical equipment
- KU13.** forms and classifications of hazardous substances
- KU14.** safe working practices while working at various hazardous sites
- KU15.** prevention and control measures to reduce risks from exposure to hazardous substances

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- KU16.** health effects associated with exposure to noise and vibration and the appropriate control measures
- KU17.** precautionary activities to prevent the fire accident
- KU18.** various causes of fire such as heating of metal, spontaneous ignition, sparking, electrical eating, loose fires (smoking, welding, etc.) chemical fires etc.
- KU19.** techniques of using the different fire extinguishers
- KU20.** different methods and material to extinguish fires
- KU21.** different materials used for extinguishing fire such as sand, water, foam, CO₂, dry powder
- KU22.** rescue techniques used during a fire hazard
- KU23.** various types of safety signs and their meaning
- KU24.** basic first aid treatment relevant to the common work place injuries e.g. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries
- KU25.** contents of written accident report
- KU26.** potential injuries and ill health associated with incorrect handling of tools and equipment
- KU27.** safe lifting and carrying practices
- KU28.** potential impact to a person who is moved incorrectly
- KU29.** personal safety, health and dignity issues relating to the movement of a person by others
- KU30.** ESD measures and 5S
- KU31.** efficient utilization and management of material and water
- KU32.** ways to recognize common electrical problems and practices of conserving electricity
- KU33.** usage of different colours of dustbins, categorization of waste into dry, wet, recyclable, nonrecyclable and items of single-use plastics
- KU34.** organization's procedure for minimizing waste
- KU35.** waste management and methods of waste disposal
- KU36.** common sources of pollution and ways to minimize it
- KU37.** names, contact information and location of people responsible for health and safety in the workplace
- KU38.** location of documents and equipment for health and safety compliance/practices in the workplace
- KU39.** safety notices, signs and instructions at workplace

Generic Skills (GS)

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

- GS1.** interpret general health and safety guidelines labels, charts, signages
- GS2.** read operation manuals
- GS3.** write health and safety compliance report
- GS4.** write an accident/incident report in local language or English
- GS5.** provide an emergency or safety incident brief to seniors or relevant authorities in a calm, clear and to-the-point manner
- GS6.** communicate general health and safety guidelines to colleagues/co-workers



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- GS7.** communicate appropriately with co-workers in order to clarify instructions and other issues
- GS8.** act in case of any potential hazards observed in the work place
- GS9.** plan and organize their own work schedule, work area, tools, equipment in compliance with organizational policies for health, safety and security
- GS10.** take adequate measures to ensure the safety of clients and visitors at the workplace
- GS11.** identify immediate or temporary solutions to resolve delays
- GS12.** evaluate the work area for health and safety risks or hazards
- GS13.** use cause and effect relations to anticipate potential issues, problems and their solution in the work area related to safety
- GS14.** recognise emergency and potential emergency situations
- GS15.** protect self and others from a health and safety risk or hazard
- GS16.** communicate and collaborate to incorporate sustainable practices (greening) in workplace processes
- GS17.** record data on waste disposal at workplace

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Deal with workplace hazards</i>	20	31	-	-
PC1. identify job-site hazards and possible causes of accident in the workplace	2	3	-	-
PC2. perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc.	3	4	-	-
PC3. use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards	3	4	-	-
PC4. follow standard safety procedures while handling tool/ ,equipment, hazardous substances and while working in hazardous environments	3	4	-	-
PC5. dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques	2	4	-	-
PC6. avoid damage of components due to negligence in electrostatic discharge (ESD) procedures	2	3	-	-
PC7. locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans)	2	3	-	-
PC8. maintain appropriate posture while handling heavy objects	1	3	-	-
PC9. apply good housekeeping practices at all times	2	3	-	-
<i>Apply fire safety practices</i>	4	9	-	-
PC10. take preventive measures to prevent fire hazards	2	3	-	-

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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<p>PC11.</p> <ul style="list-style-type: none"> • use appropriate fire extinguishers for different types of fires • Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no l 	1	3	-	-
<p>PC12. exhibit rescue and first-aid techniques in case of fire or electrocution</p>	1	3	-	-
<p><i>Follow emergencies, rescue and first-aid procedures</i></p>	6	13	-	-
<p>PC13. administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc.</p>	1	3	-	-
<p>PC14. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock,</p>	1	2	-	-
<p>PC15. participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work</p>	2	4	-	-
<p>PC16. use correct method to move injured people and others during an emergency</p>	2	4	-	-
<p><i>Effective waste management/recycling practices</i></p>	5	12	-	-
<p>PC17. identify recyclable and non-recyclable, and hazardous waste generated</p>	1	3	-	-
<p>PC18. segregate waste into different categories</p>	1	2	-	-
<p>PC19. ensure disposal of non-recyclable waste appropriately</p>	1	2	-	-
<p>PC20. deposit non-recyclable and reusable material at identified location</p>	1	3	-	-



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Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. follow processes specified for disposal of hazardous waste	1	2	-	-
NOS Total	35	65	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ELE/N1002
NOS Name	Apply health and safety practices at the workplace
Sector	Electronics
Sub-Sector	Generic
Occupation	Generic - Health Safety
NSQF Level	4
Credits	TBD
Version	3.0
Last Reviewed Date	24/02/2022
Next Review Date	24/02/2025
NSQC Clearance Date	24/02/2022

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

Minimum 70% marks are required

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

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National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ELE/N1407.Create requirement specifications and detailed design documents	40	50	-	10	100	30
ELE/N1408.Design circuit and PCB layout for the IoT system	40	50	-	10	100	30
ELE/N1409.Build and test the complete IoT system	40	50	-	10	100	20
ELE/N9905.Work effectively at the workplace	40	60	-	-	100	10
ELE/N1002.Apply health and safety practices at the workplace	35	65	-	-	100	10
Total	195	275	-	30	500	100



Qualification Pack

Acronyms

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

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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.

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Knowledge and Understanding (KU)	<p>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.</p>
Organisational Context	<p>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.</p>
Technical Knowledge	<p>Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.</p>
Core Skills/ Generic Skills (GS)	<p>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.</p>
Electives	<p>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.</p>
Options	<p>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.</p>