



Model Curriculum

QP Name: Essential Fundamentals of

IoT

QP Code: ELE/N1417

QP Version: 1.0

NSQF Level: 4

Model Curriculum Version: 1.0

Electronics Sector Skills Council of India || 155, 2nd Floor, ESC House, Okhla Industrial Area - Phase 3, New Delhi – 110020

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Training Parameters

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|---|--|
| Sector | Electronics |
| Sub-Sector | Semiconductor & Components |
| Occupation | IoT System |
| Country | India |
| NSQF Level | 4 |
| Aligned to NCO/ISCO/ISIC Code | NCO-2015/2512.0501 |
| Minimum Educational Qualification and Experience | Complete 12th or Equivalent (Science Stream) Or Pursuing 12th or Equivalent (Science Stream) |
| Pre-Requisite License or Training | NA |
| Minimum Job Entry Age | 18 years |
| Last Reviewed On | 30.04.2024 |
| Next Review Date | 30.04.2027 |
| NSQC Approval Date | 30.04.2024 |
| QP Version | 1.0 |
| Model Curriculum Creation Date | 30.04.2024 |
| Model Curriculum Valid Up to Date | 30.04.2027 |
| Model Curriculum Version | 1.0 |
| Maximum Duration of the Course | 60 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.

- Understanding IoT concepts and architectures
- Exploring various connectivity protocols and wireless technologies
- Hands-on experience with embedded systems and hardware platforms
- Addressing security challenges and emerging trends like AI/ML integration and edge computing

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 |
|---|-----------------|--------------------|--|--|----------------|
| ELE/N1417 – Essential Fundamentals of IoT | 30:00 | 30:00 | 00:00 | 00:00 | 60:00 |
| Module 1: Understanding IoT Concepts and Technologies | 10:00 | 10:00 | 00:00 | 00:00 | 00:00 |
| Module 2: Building IoT Systems | 10:00 | 10:00 | 00:00 | 00:00 | 00:00 |
| Module 3: Implementation and Security | 10:00 | 10:00 | 00:00 | 00:00 | 00:00 |
| Total Duration | 30:00 | 30:00 | 00:00 | 00:00 | 60:00 |

Module Details

Module 1: Understanding IoT Concepts and Technologies

Mapped to ELE/N1417

Terminal Outcomes:

- Describe the Overall theoretical understanding of Essential Fundamentals of IoT Training

| Duration: 10:00 | Duration: 10:00 |
|---|--|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Understanding the foundational concepts and components of the Internet of Things (IoT). Tracing the historical evolution of IoT and its transformative impact on various industries. Exploring crucial IoT technologies including sensors, connectivity protocols, and data analytics. Recognizing prevalent challenges in IoT implementation, such as security vulnerabilities and scalability issues. Evaluating the potential opportunities and risks that come with the widespread adoption of IoT solutions. | <ul style="list-style-type: none"> Ability to design and implement basic IoT systems incorporating sensors, actuators, and communication modules. Proficiency in selecting appropriate connectivity protocols and platforms based on specific IoT application requirements. Skills in utilizing data analytics tools to derive insights from IoT-generated data for decision-making. Competence in addressing security concerns through encryption, authentication, and other best practices in IoT deployments. Capability to conduct risk assessments and formulate strategies to maximize the benefits while mitigating potential risks associated with IoT implementations. |
| Classroom Aids: | |
| Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop | |
| Tools, Equipment and Other Requirements | |
| IoT Essentials Software and Hardware | |

Module 2: Building IoT Systems

Mapped to ELE/N1417

Terminal Outcomes:

- Describe the Overall Simulator understanding of Essential Fundamentals of IoT Training

| Duration: 10:00 | Duration: 10:00 |
|--|--|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> Grasping the fundamental principles underlying the design of IoT architectures powered by ARM processors. Understanding the roles and significance of computing paradigms such as cloud, fog, and edge computing in IoT deployments. Recognizing the importance of gateways in enabling seamless communication within complex IoT systems. Acquiring the ability to select appropriate architectures tailored to the unique needs and constraints of IoT applications, leveraging ARM processors. Exploring ongoing standardization efforts aimed at enhancing interoperability and security in the IoT ecosystem. | <ul style="list-style-type: none"> Proficiency in designing scalable and efficient IoT architectures optimized for ARM processor-based devices. Ability to implement and configure cloud, fog, and edge computing solutions to meet specific performance and latency requirements of IoT applications. Skills in deploying and managing gateways to facilitate data exchange and integration across diverse IoT devices and networks. Capability to evaluate and select suitable IoT architectures based on factors such as resource constraints, data processing requirements, and deployment environment, while leveraging ARM processor capabilities. Familiarity with industry standards and protocols governing IoT interoperability and security, enabling adherence to best practices in IoT architecture design and implementation. |
| Classroom Aids: | |
| Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop | |
| Tools, Equipment and Other Requirements | |
| IoT Essentials Software and Hardware | |

Module 3: Implementation and Security

Mapped to ELE/N1417

Terminal Outcomes:

- Describe the Overall Flying understanding of Essential Fundamentals of IoT Training

| Duration: 10:00 | Duration: 10:00 |
|---|--|
| Theory – Key Learning Outcomes | Practical – Key Learning Outcomes |
| <ul style="list-style-type: none"> • Definition and understanding of embedded systems and their components essential for IoT device design, leveraging ARM Processor technology. • Comparison of hardware platforms suitable for building embedded systems, considering factors like cost-effectiveness and performance optimization with ARM Processors. • Familiarization with wireless connectivity protocols such as Bluetooth, ZigBee, and Wi-Fi (IEEE 802.11) commonly used in IoT communication. • Comprehension of security measures including encryption and authentication crucial for safeguarding IoT data integrity and privacy. • Exploration of future trends in IoT technology, including AI integration and edge computing, with a focus on ARM Processor-powered advancements. | <ul style="list-style-type: none"> • Proficiency in designing and developing embedded systems tailored for IoT applications, leveraging ARM Processor capabilities. • Ability to evaluate and select appropriate hardware platforms for embedded systems based on cost, performance, and compatibility with ARM Processor architecture. • Skills in configuring and managing wireless connectivity protocols for reliable and efficient communication in IoT deployments. • Competence in implementing security measures such as encryption algorithms and authentication protocols to protect IoT data from unauthorized access and tampering. • Capability to anticipate and adapt to emerging trends like AI integration and edge computing, leveraging ARM Processor technologies to drive innovation in IoT solutions. |

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| Classroom Aids: | |
| Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop | |
| Tools, Equipment and Other Requirements | |
| IoT Essentials Software and Hardware | |

Annexure

Trainer Requirements

| Trainer Prerequisites | | | | | | |
|-----------------------------------|-------------------------------------|------------------------------|--|---------------------|--|---------|
| Minimum Educational Qualification | Specialization | Relevant Industry Experience | | Training Experience | | Remarks |
| | | Years | Specialization | Years | Specialization | |
| Graduate Science & Engineering | Electrical/ Mechanical/ Electronics | 1 | Semiconductor Technology, Cleanroom Operations | 1 | Semiconductor Technology, Cleanroom Operations | |
| Diploma/ITI | Electrical/ Mechanical/ Electronics | 2 | Semiconductor Technology, Cleanroom Operations | 1 | Semiconductor Technology, Cleanroom Operations | |

| Trainer Certification | |
|---|---|
| Domain Certification | Platform Certification |
| “Essential Fundamentals of IoT, ELE/N1417, version 1.0”. Minimum accepted score is 80%. | Recommended that the Trainer is certified for the Essential Fundamentals of IoT “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 Experience | | Remarks |
| | | Years | Specialization | Years | Specialization | |
| Graduate Science & Engineering | Electrical/ Mechanical/ Electronics | 2 | Semiconductor Technology, Cleanroom Operations | 2 | Semiconductor Technology, Cleanroom Operations | |
| Diploma/ITI | Electrical/ Mechanical/ Electronics | 3 | Semiconductor Technology, Cleanroom Operations | 2 | Semiconductor Technology, Cleanroom Operations | |

| Assessor Certification | |
|---|---|
| Domain Certification | Platform Certification |
| “Essential Fundamentals of IoT, ELE/N1417, version 1.0”. Minimum accepted score is 80%. | Recommended that the Assessor is certified for the Essential Fundamentals of IoT “Assessor (VET and Skills)”, mapped to the Qualification Pack: “MEP/Q2701, V2.0”, with minimum score of 80% |

Assessment Strategy

- Assessment System Overview:
 - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
 - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
 - Assessment agency deploys the ToA certified Assessor for executing the assessment
 - SSC monitors the assessment process & records
- Testing Environment:
 - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
 - Check the duration of the training.
 - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
 - If the batch size is more than 30, then there should be 2 Assessors.
 - Check that the allotted time to the candidates to complete Theory & Practical

Assessment is correct.

- Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
 - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
 - Check the availability of the Lab Equipment for the particular Job Role.
3. Assessment Quality Assurance levels / Framework:
- Question papers created by the Subject Matter Experts (SME)
 - Question papers created by the SME verified by the other subject Matter Experts
 - Questions are mapped with NOS and PC
 - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
 - Assessor must be ToA certified & trainer must be ToT Certified
 - Assessment agency must follow the assessment guidelines to conduct the assessment
4. Types of evidence or evidence-gathering protocol:
- Time-stamped & geotagged reporting of the assessor from assessment location
 - Centre photographs with signboards and scheme specific branding
 - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
 - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
5. Method of verification or validation:
- Surprise visit to the assessment location
 - Random audit of the batch
 - Random audit of any candidate
6. Method for assessment documentation, archiving, and access
- Hard copies of the documents are stored
 - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
 - Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

References

Glossary

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| 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. |

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| Qualifications Pack (QP) | QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code. |
| Unit Code | Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N' |
| Unit Title | Unit title gives a clear overall statement about what the incumbent should be able to do. |
| Description | Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for. |
| Scope | Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required. |
| Knowledge and Understanding (KU) | Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard. |
| Organisational Context | Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility. |
| Technical Knowledge | Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities. |
| Core Skills/ Generic Skills (GS) | Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles. |
| Electives | Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives. |
| Options | Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options. |

Acronyms and Abbreviation

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