National Occupational Standards


# Fundamentals of AIOT (Artificial Intelligence of Things)

Unit Code: ELE/N7122

Version: 1.0

NSQF Level: 2.5

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

## Description

Fundamentals of AIOT (Artificial Intelligence of Things) Entry Level Course aims to improve human-machine interactions, increase data management and analytics, and make IoT operations more efficient. In order to ensure the sustainable development of the country, this module aims to introduce concepts of cognitive science, Internet of Things, and Artificial Intelligence (AI) to those with little to no prior knowledge. It will also help instill a reasoned thinking approach and solve societal problems using technological skills. In order to promote a meaningful and productive learning experience, the module covers the fundamentals of AIOT as well as the most recent tools and approaches in a hands-on, interactive workbook-style format.

## Scope

The scope covers the following :

- The scope covers the following:
- 1) Testing and learning how to use the Internet of things for a variety of purposes.
- 2) Testing, learning how to use artificial intelligence to train machine learning models, and understanding the roles played by both human and machine
- learning processes.

## Elements and Performance Criteria

*Definition of Internet of Things*

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

**PC1.** Determine the various components of an internet of things (IoT)

**PC2.** Identify the various types of problems that IoT can solve

**PC3.** Understanding the fundamental functions and applications of IoT, such as Data Collection, Sensing the Environment, as well as basic coding

**PC4.** Recognize the function of every part used in the IoT system

*Gaining an understanding of fundamental IoT concepts through applications*

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

**PC5.** Understand the basic electronics with coding

**PC6.** Recognize how to interface sensors in IoT systems

**PC7.** Explain the problem-solving process of IoT. Identify a problem and break it down into various components

**PC8.** Understand the monitor of the deployed IoT assets using the cloud system

*Define Artificial Intelligence and Machine Learning*

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

**PC9.** Use selected AI applications online to explore various types of AI Models

**PC10.** Identify the various types of problems that AI can solve

**PC11.** Identify the various components of human learning

**PC12.** Identify the various ways of machine learning- Supervised Learning, Unsupervised Learning

*Gaining an understanding of Data, Database, Dataset, Data Visualization, Data Science and Big Data*

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

**PC13.** Recognize different types of data and explore how the same data can be represented in different ways

**PC14.** Explain the role of Algebra, Probability, and Statistics in AI. Explain the need for data visualization in AI

**PC15.** Explain the problem-solving process of AI. Identify a problem and break it down into various components

**PC16.** Train or teach existing AI applications such as voice recognition or face recognition software

*Define requirements and Monitor*

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

**PC17.** Discuss the evolution of IoT and the trends that have led to it

**PC18.** Learn how to use the Arduino Integrated Development Environment (IDE) and ESP's software tools to program IoT applications

**PC19.** Ensure that the need and requirement for interoperability between various connectivity interfaces are maintained

**PC20.** check standard tools to simulate, analyse and synthesize design options for electronic circuits

*Carry out troubleshooting for IoT devices*

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

**PC21.** • check the power management modules, Radio Frequency (RF), energy and sensing modules for any malfunctioning and carry out
• troubleshooting accordingly

**PC22.** • examine the sensors and transducers to identify faults with them and carry out appropriate
• troubleshooting

**PC23.** test data transfer from the IoT device to the cloud server

**PC24.** • identify issues with different types of microcontrollers through testing and perform troubleshooting
• or replacing the faulty/damaged microcontrollers with correct equipment

*Describe the machine learning process*

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

**PC25.** Differentiate between artificial intelligence and machine learning

**PC26.** Explain how neural networks and deep learning works, Differentiate between NLP and NLU

**PC27.** Build machine learning solutions using MLaaS platforms

*Analyze the technical tools*

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

**PC28.** • Create a relational database with tables filled with Fields and their values. Use SQL to create, update, delete, query and modify data from a
• relational database

**PC29.** Explain what is Computer Vision (CV) and how it works

**PC30.** State core programming concepts. Apply python codes to simple machine learning projects

**PC31.** • List the key machine learning algorithms for supervised, unsupervised and reinforcement learning. Train and evaluate a classification,
• regression and clustering model algorithm

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

**KU1.** The basics of C, Embedded C, C plus plus, Arduino
**KU2.** The fundamentals of digital electronics
**KU3.** The functioning of cloud computing platforms
**KU4.** The networking fundamentals, such as Transmission Control Protocol TCP)/Internet
**KU5.** Products offered by the organization
**KU6.** Organizational policy on other terms and conditions
**KU7.** Instructions provided by the manufacturer for proper operations

## Generic Skills (GS)

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

**GS1.** Maintain work related notes and records
**GS2.** Read the relevant literature to get the latest updates about the field of work
**GS3.** Listen attentively to understand the information/ instructions being shared.
**GS4.** Communicate politely and professionally
**GS5.** Plan and organize your own work to achieve targets and deadlines
**GS6.** Make decisions on suitable courses of action
**GS7.** Measure different parameters based on the needs of the assignment

## Assessment Criteria

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| *Definition of Internet of Things* | **4** | **4** | **-** | **-** |
| **PC1.** Determine the various components of an internet of things (IoT) | 1 | 1 | - | - |
| **PC2.** Identify the various types of problems that IoT can solve | 1 | 1 | - | - |
| **PC3.** Understanding the fundamental functions and applications of IoT, such as Data Collection, Sensing the Environment, as well as basic coding | 1 | 1 | - | - |
| **PC4.** Recognize the function of every part used in the IoT system | 1 | 1 | - | - |
| *Gaining an understanding of fundamental IoT concepts through applications* | **4** | **4** | **-** | **-** |
| **PC5.** Understand the basic electronics with coding | 1 | 1 | - | - |
| **PC6.** Recognize how to interface sensors in IoT systems | 1 | 1 | - | - |
| **PC7.** Explain the problem-solving process of IoT. Identify a problem and break it down into various components | 1 | 1 | - | - |
| **PC8.** Understand the monitor of the deployed IoT assets using the cloud system | 1 | 1 | - | - |
| *Define Artificial Intelligence and Machine Learning* | **4** | **6** | **-** | **-** |
| **PC9.** Use selected AI applications online to explore various types of AI Models | 1 | 1 | - | - |
| **PC10.** Identify the various types of problems that AI can solve | 1 | 1 | - | - |
| **PC11.** Identify the various components of human learning | 1 | 2 | - | - |
| **PC12.** Identify the various ways of machine learning- Supervised Learning, Unsupervised Learning | 1 | 2 | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| *Gaining an understanding of Data, Database, Dataset, Data Visualization, Data Science and Big Data* | **6** | **8** | **-** | **-** |
| **PC13.** Recognize different types of data and explore how the same data can be represented in different ways | 1 | 2 | - | - |
| **PC14.** Explain the role of Algebra, Probability, and Statistics in AI. Explain the need for data visualization in AI | 1 | 2 | - | - |
| **PC15.** Explain the problem-solving process of AI. Identify a problem and break it down into various components | 2 | 2 | - | - |
| **PC16.** Train or teach existing AI applications such as voice recognition or face recognition software | 2 | 2 | - | - |
| *Define requirements and Monitor* | **8** | **8** | **-** | **-** |
| **PC17.** Discuss the evolution of IoT and the trends that have led to it | 2 | 2 | - | - |
| **PC18.** Learn how to use the Arduino Integrated Development Environment (IDE) and ESP's software tools to program IoT applications | 2 | 2 | - | - |
| **PC19.** Ensure that the need and requirement for interoperability between various connectivity interfaces are maintained | 2 | 2 | - | - |
| **PC20.** check standard tools to simulate, analyse and synthesize design options for electronic circuits | 2 | 2 | - | - |
| *Carry out troubleshooting for IoT devices* | **8** | **8** | **-** | **-** |
| **PC21.**<br>• check the power management modules, Radio Frequency (RF), energy and sensing modules for any malfunctioning and carry out<br>• troubleshooting accordingly | 2 | 2 | - | - |
| **PC22.**<br>• examine the sensors and transducers to identify faults with them and carry out appropriate<br>• troubleshooting | 2 | 2 | - | - |

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|---|---|---|---|
| **PC23.** test data transfer from the IoT device to the cloud server | 2 | 2 | - | - |
| **PC24.**<br>• identify issues with different types of microcontrollers through testing and perform troubleshooting<br>• or replacing the faulty/damaged microcontrollers with correct equipment | 2 | 2 | - | - |
| *Describe the machine learning process* | **6** | **6** | **-** | **-** |
| **PC25.** Differentiate between artificial intelligence and machine learning | 2 | 2 | - | - |
| **PC26.** Explain how neural networks and deep learning works, Differentiate between NLP and NLU | 2 | 2 | - | - |
| **PC27.** Build machine learning solutions using MLaaS platforms | 2 | 2 | - | - |
| *Analyze the technical tools* | **8** | **8** | **-** | **-** |
| **PC28.**<br>• Create a relational database with tables filled with Fields and their values. Use SQL to create, update, delete, query and modify data from a<br>• relational database | 2 | 2 | - | - |
| **PC29.** Explain what is Computer Vision (CV) and how it works | 2 | 2 | - | - |
| **PC30.** State core programming concepts. Apply python codes to simple machine learning projects | 2 | 2 | - | - |
| **PC31.**<br>• List the key machine learning algorithms for supervised, unsupervised and reinforcement learning. Train and evaluate a classification,<br>• regression and clustering model algorithm | 2 | 2 | - | - |
| **NOS Total** | **48** | **52** | **-** | **-** |

## National Occupational Standards (NOS) Parameters

| | |
|---|---|
| **NOS Code** | ELE/N7122 |
| **NOS Name** | Fundamentals of AIOT (Artificial Intelligence of Things) |
| **Sector** | Electronics |
| **Sub-Sector** | |
| **Occupation** | Engineering-I&A |
| **NSQF Level** | 2.5 |
| **Credits** | 7 |
| **Minimum Educational Qualification & Experience** | 9th Class with NA of experience<br>OR<br>8th grade pass and pursuing continuous schooling with NA of experience |
| **Version** | 1.0 |
| **Last Reviewed Date** | 27/08/2024 |
| **Next Review Date** | 27/08/2027 |
| **NSQC Clearance Date** | 27/08/2024 |
| **Reference code on NQR** | NG-2.5-EH-02976-2024-V1-ESSC |
| **NQR Version** | 1.0 |
| **CCN Category** | 1 |