

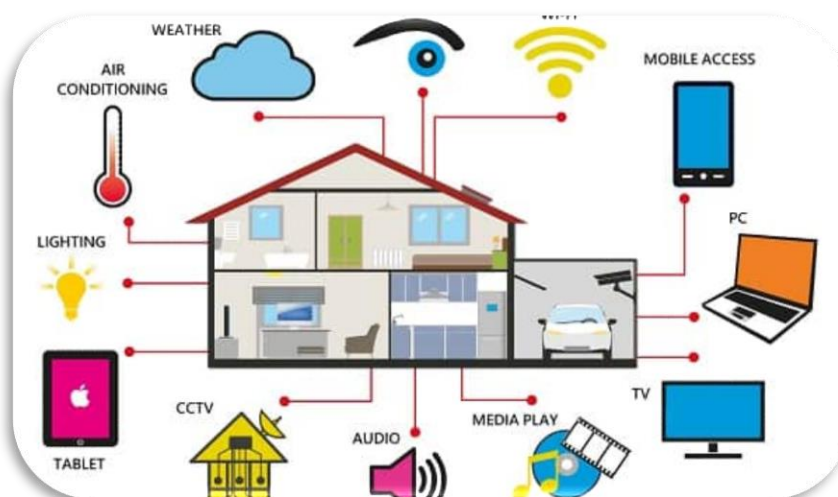


GOVERNMENT OF INDIA  
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP  
DIRECTORATE GENERAL OF TRAINING

**COMPETENCY BASED CURRICULUM**

**CERTIFICATE COURSE ON**

# **FUNDAMENDALS OF IoT APPLICATION & MAINTENANCE**



**NSQF LEVEL- 3.5**

## **SECTOR: ELECTRONICS & HARDWARE**

# FUNDAMENTALS OF IOT APPLICATION AND MAINTENANCE

**Duration: 240 Hours**

**NSQF LEVEL- 3.5**

**(Version: 1.0)**

**Designed in 2024**

**Developed By**

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

**&**

**CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE**

EN-81, Sector-V, Salt Lake City,  
Kolkata – 700 091

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## 1. COURSE INFORMATION

### 1.1 GENERAL

This course has been developed for CTS/CITS trainees to take up as optional courses during course of study for technical and behavioural upgradation of trainees to meet industry related job roles. During the 240 hours duration of Fundamentals of IoT Application and Maintenance course, a candidate is trained on professional skills & knowledge related to job role. The Broad components covered during the course are given below:

During the course, the trainee will identify and select different wireless communication modules and topology to generate and record the data. They will learn to identify and test wireless network component such as Bluetooth module /Wifi Module/GSM Module. They will perform installation, configuration and check working of IOT devices, network, database, app and web services. They will learn to monitor environmental parameters like Temperature, Humidity, Air Quality etc.

### 1.2 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of 6 weeks: -

| S No. | Course Element                        | Notional Training Hours |
|-------|---------------------------------------|-------------------------|
| 1.    | Professional Skill (Trade Practical)  | 180                     |
| 2.    | Professional Knowledge (Trade Theory) | 60                      |
|       | <b>Total</b>                          | <b>240</b>              |

### 1.3 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through assessment at the end of the course through skill testing at Training Center & CBT through examination conducted by DGT.

The minimum pass percentage for skill test is 60% and for theory will be 33% as in main CTS examination.

## 2. JOB ROLE

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**IoT System Operation and Maintenance Technician** include installers and servicers who install, repair and maintain telecommunications equipment, data transmission equipment, cables, antennae and conduits and repair, fit and maintain computers not elsewhere classified.

**Reference NCO-2015:**

7422.9900: Information and Communications Technology Installers and Servicers, Other;

**Mapped NOS:**

- i) ELE/N9505
- ii) ELE/N9506
- iii) ELE/N9507
- iv) ELE/N9508
- v) ELE/N9509
- vi) ELE/N9510

### 3. GENERAL INFORMATION

|                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Name of the Trade</b>                                           | <b>Fundamentals of IoT Application and Maintenance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Reference NCO - 2015</b>                                        | 7422.9900                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>NOS Covered</b>                                                 | ELE/N9505, ELE/N9506, ELE/N9507, ELE/N9508, ELE/N9509, ELE/N9510                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>NSQF Level</b>                                                  | 3.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Duration of Craftsmen Training</b>                              | 240 Hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Entry Qualification</b>                                         | 10 <sup>th</sup> Class passed and pursuing/ passed out Electronic Mechanic, CHNM, ICTSM, Instrument Mechanic under CTS and Electronic Mechanic, Instrument Mechanic, CHNM under CITS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Unit Strength (No. of Student), Space Norms and Power Norms</b> | As per affiliated mapped trade of IoT Technician (Smart Agriculture), IoT Technician (Smart Healthcare), IoT Technician (Smart City) under CTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Instructors Qualification for:</b>                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>1. Fundamentals of IoT Application and Maintenance</b>          | <p>B.Voc/Degree in Electronics/ Electronics and Telecommunication/ Electronics and communication/Electronics and Instrumentation Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.</p> <p style="text-align: center;"><b>OR</b></p> <p>Diploma (3 years) in Electronics/ Electronics and telecommunication/ Electronics and communication/Electronics and Instrumentation from AICTE/recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.</p> <p style="text-align: center;"><b>OR</b></p> <p>NTC/NAC passed in the Trade of "IoT Technician (Smart City)" or "IoT Technician (Smart Healthcare)" or "IoT Technician (Smart Agriculture)" With three years' experience in the relevant field.</p> <p><b><u>Essential Qualification:</u></b><br/>Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT.</p> |
| <b>List of Tools and Equipment</b>                                 | As per Annexure – I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 4. LEARNING OUTCOME

***Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.***

### LEARNING OUTCOMES

1. Identify different IoT Applications with IoT architecture also Identify, test and interconnect components/parts of IoT system. (NOS: ELE/N9505)
2. Select and interface various types of sensors based on the applications used in Smart City. (NOS: ELE/N9506)
3. Identify and test Wired & Wireless communication medium such as RS485, Ethernet, Wi-Fi, GSM, GPRS, RF etc. and Communication protocol. (NOS: ELE/N9507)
4. Write application logic for IoT Applications using No-code Block Programming software. (NOS: ELE/N9508)
5. Perform installation, configuration and check working of IOT devices, network, database, app and web services. Monitor environmental parameters like Temperature, Humidity. (NOS: ELE/N9509)
6. Establish and troubleshoot IoT connectivity of devices to cloud having multiple communication medium, protocols, device management and monitoring. (NOS: ELE/N9510)

## 5. SYLLABUS

| SYLLABUS – FUNDAMENTALS OF IOT APPLICATION AND MAINTENANCE        |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Duration: 240 Hours                                               |                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Duration Weeks                                                    | Reference Learning outcome                                                                                                     | Professional Skills (Trade Practical)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Professional Knowledge (Trade Theory)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Professional Skill 18 Hrs.;<br><br>Professional Knowledge 12 Hrs. | Identify different IoT Applications with IoT architecture also Identify, test and interconnect components/parts of IoT system. | <ol style="list-style-type: none"> <li>1. Connect and test Arduino with ESP-32, Raspberry-pi board to computer and execute sample programs from the example list.</li> <li>2. Upload computer code to the physical board (Microprocessor, Microcontroller) to blink a simple LED.</li> <li>3. Write and upload computer code to the IoT Gateway to sound buzzer.</li> <li>4. Design a Circuit and program to Interface light sensor – LDR with IoT Gateway to switch ON/OFF LED based on light intensity.</li> <li>5. Rig up the Circuit and upload a program to Control a relay and switch on/off LED light using IoT Gateway</li> <li>6. Make Circuit and upload a program to Interface of LCD display with a IoT Gateway to display characters.</li> <li>7. Rig up the circuit and upload a program to interface temperature sensor-with a IoT Gateway to display temperature on</li> </ol> | <p>Internet of Things detailed explanation and applications in smart city &amp; their distinctive advantages - smart environment, smart street light and smart water &amp; waste management.</p> <p>What is an IOT? What makes embedded system an IOT? Role and scope of IOT in present and future marketplace.</p> <p>Smart objects, Wired – Cables, hubs etc. Wireless – RFID, WiFi, Bluetooth etc.</p> <p>Different functional building blocks of IOT architecture.</p> <p>Arduino development board, Pin diagram, Functional diagram, Hardware familiarization and operating instructions.</p> <p>Raspberry Pi-based IoT Gateway, pin and port diagram, dedicated ports for SPI, I2C, UART &amp; USB, Analog &amp; Digital ports/pins, dedicated Keypad &amp; Camera ports, Relay &amp; Motor Controller familiarization with operating instructions</p> |

|                                                                          |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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|                                                                          |                                                                                                                                         | <p>the LCD / mobile interface</p> <p>8. Set up Circuit and upload program to Interface DC motor (actuator) with IoT Gateway to control on/off/forward/reverse operations.</p> <p>9. Rig up Circuit and upload program on IoT Gateway to switch on/off two lights using relay.</p>                                                                                                  | <p>Integrated development Environment, Running Programs on IDE, simple Programming concepts.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>Professional Skill 24 Hrs.;</p> <p>Professional Knowledge 06 Hrs.</p> | <p>Select and interface various types of sensors based on the applications used in Smart City.</p>                                      | <p>10. Identify and select appropriate sensor as per requirement.</p> <p>11. Determine air quality and use noise pollution Sensors.</p> <p>12. Measure PM2.5 and PM10 levels using Electrochemical Sensors.</p> <p>13. Explore sensors used in weather monitoring system. Measure air temperature, humidity, atmospheric pressure</p> <p>14. Install and configure IP Cameras.</p> | <p>Principle of operation of various sensors used in Smart city; their roles and characteristics.</p> <p>Selection of appropriate sensor as per requirement.</p> <p>Use of air quality and noise pollution Sensors.</p> <p>Measurement of PM2.5 and PM10 levels using Electrochemical Sensors for pollution control in smart environment.</p> <p>Explore sensors used in weather monitoring system.</p> <ul style="list-style-type: none"> <li>• Measurement and record of Information such as air temperature, wind speed, dew point temperature, atmospheric pressure etc. at predetermined intervals by Weather Stations.</li> <li>• Introduction to IP Cameras</li> </ul> |
| <p>Professional Skill 48 Hrs.;</p> <p>Professional Knowledge 12 Hrs.</p> | <p>Identify and test Wired &amp; Wireless communication medium such as RS485, Ethernet, Wi-Fi, GSM, GPRS, RF etc. and Communication</p> | <p>15. Identify the interfacing of Bluetooth module to create local sensor network.</p> <p>16. Interface GSM module to make node as a gateway.</p> <p>17. Apply IoT Gateway using</p>                                                                                                                                                                                              | <p>Introduction to, Block of Zigbee, Introduction to Concept of interfacing of Bluetooth module to local sensor network, interfacing of GSM modules and other gateways.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                                                          |                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                 |
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|                                                                          | protocol.                                                                                                                            | <p>WiFi and Ethernet.</p> <p>18. Check UART Communication, Communication, I2C Protocol device interfacing SPI Protocol device interfacing, Ethernet configuration, Wi-Fi AP and Router interfacing.</p> <p>19. Test the smart phone and its features, use of sensors &amp; usage.</p> <p>20. Check the bluetooth module along and explore the possibility of pairing with Android Smart Phone.</p> <p>21. Check the GSM Module and its interconnections.</p> <p>22. Test GPS module.</p> <p>23. Check Wifi module.</p> <p>24. Configure and Test Local Area Networks over Ethernet &amp; Wi-Fi.</p> | <p>IoT Gateway using WiFi and Ethernet.</p> <p>Application of GPS satellites in Location Sensors.</p> <p>Creation of a combine sensor appropriate for local climate monitoring.</p> <p>Concept of Weather Stations.</p>                                                                         |
| <p>Professional Skill 24 Hrs.;</p> <p>Professional Knowledge 06 Hrs.</p> | Write application logic for IoT Applications using No-code Block Programming software.                                               | <p>25. Write and execute Simple block programs for mathematical &amp; text operations on IoT Gateway</p> <p>26. Write and test block programs for interfacing various sensors with IoT Gateway, execute and demonstrate results on cloud using web/mobile application interface</p>                                                                                                                                                                                                                                                                                                                 | <p>Features of Block Programming interface, supported sensors and devices, understanding commonly used blocks for logical, mathematical, text &amp; other routine operations, blocks for cloud connectivity, study of auto-generated code, downloading/transferring the code to IoT Gateway</p> |
| <p>Professional Skill 18 Hrs.;</p> <p>Professional Knowledge 12 Hrs.</p> | Perform installation, configuration and check working of IOT devices, network, database, app and web services. Monitor environmental | <p>27. Check IoT Gateway using Wi-Fi and Ethernet.</p> <p>28. Manage directories and files.</p> <p>29. Test Cloud and Server Configuration for IoT.</p> <p>30. Test IoT Web and</p>                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>IoT gateway with internet and WiFi</p> <p>Cloud and Server Configuration for IoT.</p> <p>IoT Web and Application Development Tools for IoT.</p> <p>Principle of operation,</p>                                                                                                               |

|                                                                          |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|                                                                          | parameters like Temperature, Humidity.                                                                                                             | <p>Application Development Tools for IoT.</p> <p>31. Power up the smart Energy Meter (similar device) as per the device manual.</p> <p>32. Select and Install Carbon dioxide sensors.</p> <p>33. Identify and Install Oxygen sensors.</p> <p>34. Identify and Install Air temperature, Air humidity atmospheric pressure</p> <p>35. Select and Install Ozone Soil Moisture and Soil Temperature sensor.</p> <p>36. Demonstrate ultrasonic and IR sensor for smart parking, PIR for human presence.</p> | <p>selection and installation of Carbon dioxide sensors, Oxygen sensors.</p> <p>Volatile organic compound sensor</p> <p>Selection and Installation of Air temperature, Air humidity and atmospheric pressure, UV sensor, Nitric Oxide (NO), Hydrogen Sulphide, Sulphur Dioxide, Carbon Monoxide, Ozone Soil Moisture and Soil Temperature sensor.</p> <p>Study and test of Magnetic field for smart parking, IR for human presence.</p> <p>Study and test of Hall Effect (doors and windows openings),</p> |
| <p>Professional Skill 48 Hrs.;</p> <p>Professional Knowledge 12 Hrs.</p> | Establish and troubleshoot IoT connectivity of devices to cloud having multiple communication medium, protocols, device management and monitoring. | <p>37. Setup Ethernet IoT Data Acquisition system, connect to cloud and verify.</p> <p>38. Setup WiFi IoT Data Acquisition system, connect to cloud and verify</p> <p>39. Setup Cellular (GSM / GPRS) IoT Data Acquisition system, connect to cloud and verify</p> <p>40. Explore IoT Cloud Configuration utility.</p> <p>41. Create / modify organization, Connect devices over cloud.</p> <p>42. Configuration of parameters, alarms, notifications on cloud platform.</p>                           | <p>Device connectivity over cloud and troubleshooting.</p> <p>IoT device and its parameter configuration</p> <p>Cloud Device Management and troubleshooting.</p> <p>Understanding of IoT enabled Dashboard, Web/Mobile interfaces.</p>                                                                                                                                                                                                                                                                     |

|                    |  |                                                                                                                    |  |
|--------------------|--|--------------------------------------------------------------------------------------------------------------------|--|
|                    |  | <p>43. Explore user management roles and security.</p> <p>44. Observer Device Diagnostics for troubleshooting.</p> |  |
| <b>Examination</b> |  |                                                                                                                    |  |

## 6. ASSESSMENT CRITERIA

| LEARNING OUTCOME                                                                                                                                           | ASSESSMENT CRITERIA                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Identify different IoT Applications with IoT architecture also Identify, test and interconnect components/parts of IoT system. (NOS: ELE/N9505)         | Identify various IoT Applications in smart city viz. smart street light and smart water & waste management.                                                                               |
|                                                                                                                                                            | Recognize the functions of various IoT Technician (Smart City) (IoT) applications & their distinctive advantages.                                                                         |
|                                                                                                                                                            | Identify and explore different functional building blocks of IOT enabled system / application.                                                                                            |
|                                                                                                                                                            | Explore signal flow into IOT enabled system/application as per the IOT architecture.                                                                                                      |
|                                                                                                                                                            | Connect and test Arduino board to computer and execute sample programs from the example list.                                                                                             |
|                                                                                                                                                            | Write and upload computer code to the physical Arduino board Micro controller to sound buzzer.                                                                                            |
|                                                                                                                                                            | Set up & test circuit to interface potentiometer with Arduino board and map to digital values.                                                                                            |
|                                                                                                                                                            | Rig up the circuit and upload a program to interface temperature sensor – LM35 with a controller to display temperature on the LCD.                                                       |
|                                                                                                                                                            | Set up Circuit and upload program to Interface DC motor (actuator) with microcontroller to control on/off/forward/reverse operations.                                                     |
| 2. Select and interface various types of sensors based on the applications used in Smart City. (NOS: ELE/N9506)                                            | Identify Roles and characteristics of various sensors used in Smart city.                                                                                                                 |
|                                                                                                                                                            | Select appropriate sensor as per requirement.                                                                                                                                             |
|                                                                                                                                                            | Determine air quality and use noise pollution Sensors.                                                                                                                                    |
|                                                                                                                                                            | Measure PM2.5 and PM10 levels using Electrochemical Sensors.                                                                                                                              |
| 3. Identify and test Wired & Wireless communication medium such as RS485, Ethernet, Wi-Fi, GSM, GPRS, RF etc. and Communication protocol. (NOS: ELE/N9507) | Check the blue tooth module along and explore the possibility of pairing with Android Smart Phone.                                                                                        |
|                                                                                                                                                            | Check the GSM Module and its interconnections.                                                                                                                                            |
|                                                                                                                                                            | Cable selection and Termination for Wired Communication Mediums: Pin Diagram, Cable Core, characteristics and specifications, Connector and crimping of various RJ9/RJ11/RJ45 connectors. |
|                                                                                                                                                            | Frequency Band, Gain, Antenna and Modulation selection for wireless communication Mediums                                                                                                 |
|                                                                                                                                                            | Basic Network Configuration of Local Area Networks - Ethernet, Wi-Fi.                                                                                                                     |
| 4. Write application logic for IoT Applications using No-code Block Programming software.                                                                  | Explain Block Programming interface, features, supported sensors and devices                                                                                                              |
|                                                                                                                                                            | Demonstrate use of commonly required blocks for logical, mathematical, text operations on IoT Gateway using a web/mobile app                                                              |

|                                                                                                                                                                                                                  |                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (NOS: ELE/N9508)                                                                                                                                                                                                 | Write and execute on IoT Gateway block programs to interface different sensors and devices. Display results on cloud using web/mobile application interface                       |
| 5. Perform installation, configuration and check working of IoT devices, network, database, app and web services. Monitor environmental parameters like Temperature, Humidity, Air Quality etc. (NOS: ELE/N9509) | Sensors Node communication and testing                                                                                                                                            |
|                                                                                                                                                                                                                  | Check IoT Gateway using WiFi and Ethernet.                                                                                                                                        |
|                                                                                                                                                                                                                  | Configure IoT Connectivity using GSM/GPRS networks for MODBUS over MQTT in IoT Applications                                                                                       |
|                                                                                                                                                                                                                  | Configure IoT Connectivity with cloud platform using HTTP, FTP and CoAP.                                                                                                          |
|                                                                                                                                                                                                                  | Test Cloud and Server Configuration for IoT.                                                                                                                                      |
|                                                                                                                                                                                                                  | Select and Install Carbon dioxide sensors, Oxygen sensors, Volatile organic compound sensor etc. as per requirement.                                                              |
|                                                                                                                                                                                                                  | Identify and Install Air temperature, Air humidity atmospheric pressure and UV sensor.                                                                                            |
| 6. Establish and troubleshoot IoT connectivity of devices to cloud having multiple communication medium, protocols and networking topology and device management and monitoring. (NOS: ELE/N9510)                | Configure and integrate multiple devices with serial protocol working on RS485 MODBUS Master –Slave architecture such as Solar Inverter, Solar Pump Controller, Energy Meter etc. |
|                                                                                                                                                                                                                  | Configure cellular IoT Connectivity using GSM/GPRS networks for MODBUS over MQTT in IoT Applications                                                                              |
|                                                                                                                                                                                                                  | Select, Configure and ascertain various media converters to convert serial devices to Ethernet, Wi-Fi and GPRS Devices                                                            |
|                                                                                                                                                                                                                  | Select, Configure and ascertain various protocol converters to convert serial as well as networking devices to IoT Devices                                                        |
|                                                                                                                                                                                                                  | Create / Modify and Configure IoT Devices and its parameters on cloud platform                                                                                                    |
|                                                                                                                                                                                                                  | Monitor and Diagnose IoT Devices on cloud platform                                                                                                                                |
|                                                                                                                                                                                                                  | Configure parameters, alarms, notifications on cloud platform                                                                                                                     |
|                                                                                                                                                                                                                  | Create / Modify organization and users to access device data with user management roles and security                                                                              |

## ANNEXURE-I

| LIST OF TOOLS & EQUIPMENT                                                                                                     |                                                                                                                                                                                                                                                                                                                         |                                                                                                                        |                          |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Fundamentals of IoT Application and Maintenance                                                                               |                                                                                                                                                                                                                                                                                                                         |                                                                                                                        |                          |
| S No.                                                                                                                         | Name of the Tools and Equipment                                                                                                                                                                                                                                                                                         | Specification                                                                                                          | Quantity                 |
| Same as IoT Technician (Smart Agriculture), IoT Technician (Smart Healthcare) and IoT Technician (Smart City) trade under CTS |                                                                                                                                                                                                                                                                                                                         |                                                                                                                        |                          |
| Additional Tools and Equipment Required                                                                                       |                                                                                                                                                                                                                                                                                                                         |                                                                                                                        |                          |
| 1.                                                                                                                            | Arduino Yun/ESP 32 and Raspberry-pi 4 and above based IoT Gateway can be connected to the cloud, accessories, analog and digital ports, support for stepper motor, servo motors, UART port for serial data communication and separate port for I2C, Integrated RTC, Integrated relays, keypad port Inbuilt DAC and ADC. | Arduino and Raspberry-pi IoT system with all accessories sensors and cloud access minimum of 10 sensors                | 06 sets                  |
| 2.                                                                                                                            | Arduino compatible ethernet shield                                                                                                                                                                                                                                                                                      |                                                                                                                        | 6 no.                    |
| 3.                                                                                                                            | Cloud Platform supporting IoT Services such as MQTT                                                                                                                                                                                                                                                                     | data storage, analysis, and remote access                                                                              | 1 multiuser subscription |
| 4.                                                                                                                            | Cloud-Based software for IoT Circuit Designing                                                                                                                                                                                                                                                                          | create, modify, and test circuit designs before implementing them in real-world devices                                | 1 multiuser subscription |
| 5.                                                                                                                            | Cloud-based software for IoT Block Programming                                                                                                                                                                                                                                                                          | Write software programs using Programmer IDE also with no code programming.                                            | 1 multiuser subscription |
| 6.                                                                                                                            | Web/Mobile Interface to Manage IoT Application                                                                                                                                                                                                                                                                          | Execute and run programs in the terminal interface to provide immediate feedback to students on their code performance | 1 multiuser subscription |
| 7.                                                                                                                            | Cloud based IDE for Python Programming                                                                                                                                                                                                                                                                                  | Development environment for writing python program for IoT                                                             | 1 multiuser subscription |

## ANNEXURE-II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts and all others who contributed in designing/ revising the curriculum. Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

**List of Expert Members participated in the trade committee meeting for finalizing the course curriculum of Fundamentals of IoT Application and Maintenance under STC on 30.04.2024 at CSTARI, Kolkata**

| Sl. No. | Name and Designation (Shri/Smt./Kumari)                       | Organization with Address                          | Remarks  |
|---------|---------------------------------------------------------------|----------------------------------------------------|----------|
| 1.      | Sunil Kumar Gupta, DDG (ER)                                   | CSTARI, Kolkata                                    | Chairman |
| 2.      | G. C. Saha, Joint Director/HoD                                | CSTARI, Kolkata                                    | Member   |
| 3.      | Brindaban Das, Deputy Director/HOO                            | CSTARI, Kolkata                                    | Member   |
| 4.      | Prodip Mukhopadhyay, former MD WEBEL & Sr. Advisor            | MAKAUT, Kolkata                                    | Member   |
| 5.      | Tapas Kumar Chini, Ex. Senior Professor                       | SINP, Kolkata & RKM, Belurmath                     | Member   |
| 6.      | Aditya Mandal, Head RF Section                                | VECC, Bidhannagar                                  | Member   |
| 7.      | Reema Nandi, Associate Manager                                | Accenture, Unitech Kolkata                         | Member   |
| 8.      | S. Chakrabrty                                                 | GVR, Kolkata                                       | Member   |
| 9.      | Biswasjit Jana, Instructor                                    | Don Bosco Technical Institute, Prakcirus           | Member   |
| 10.     | Nishchal, Scientist 'C'                                       | STQC, ERTL(E), Sector-v                            | Member   |
| 11.     | Sayan Mondal, Asst. Prof                                      | BIT, Bantala, Kolkata                              | Member   |
| 12.     | Patra Kusum Misra, Asst. Prof.                                | T.C.E Agartala                                     | Member   |
| 13.     | Niladri Roy, Consultant                                       | TCS                                                | Member   |
| 14.     | Bijayeelaxmi Panda, Engineer                                  | CTTC                                               | Member   |
| 15.     | Shekhar Pradhan, Co-Founder & Director of Business Operations | Grok Learning Pvt. Ltd.                            | Member   |
| 16.     | Makarand Joshi, Product Manager                               | Grok Learning Pvt. Ltd.                            | Member   |
| 17.     | Himanshu Samal, Global Head Sales & Strategic partnerships    | Grok Learning Pvt. Ltd.                            | Member   |
| 18.     | Satyabrata Pandab, Engineer                                   | Central Tool Room and Training Centre, Bhubaneswar | Member   |
| 19.     | Mananjaya Nayak Engineer (Training Department)                | Central Tool Room and Training Centre, Bhubaneswar | Member   |
| 20.     | Akshay Jadhav, Sr Design Engineer                             | Tata Technologies                                  | Member   |
| 21.     | Sunil Chore, Managing Director                                | Simusoft Technologies, Pune                        | Member   |

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|-----|----------------------------------------|------------------------------------|--------|
| 22. | Manohar Sadashiv Desai, Technical Head | Skill Bahn LLP, Thane, Maharashtra | Member |
| 23. | B. Sharanappa, Assistant Director      | CSTARI, Kolkata                    | Member |
| 24. | Sk. Altaf Hossain, Assistant Director  | CSTARI, Kolkata                    | Member |
| 25. | M.J. Vijaya Raju, Assistant Director   | CSTARI, Kolkata                    | Member |
| 26. | Akhilesh Pandey, Assistant Director    | CSTARI, Kolkata                    | Member |
| 27. | P. K. Bairagi, Training Officer        | CSTARI, Kolkata                    | Member |
| 28. | B. Biswas, Training Officer            | CSTARI, Kolkata                    | Member |
| 29. | Swapan Sen, Training Officer           | CSTARI, Kolkata                    | Member |
| 30. | Pradip Biswas, Jr. D/Man               | CSTARI, Kolkata                    | Member |
| 31. | Hemant Kujur, Jr. D/Man                | CSTARI, Kolkata                    | Member |
| 32. | Jinendran PK, JC                       | CSTARI, Kolkata                    | Member |
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