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

COMPETENCY BASED CURRICULUM

INDUSTRIAL INTERNET OF THINGS (IIoT) TECHNICIAN

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL – 4

SECTOR – IT & ITeS

Directorate General of Training

INDUSTRIAL INTERNET OF THINGS (IIoT) TECHNICIAN

(Non-Engineering Trade)

(Designed in 2024)

Version: 1.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL – 4

Developed By

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1. COURSE INFORMATION

During the one-year duration of INDUSTRIAL INTERNET OF THINGS (IIoT) TECHNICIAN trade a candidate is trained on professional Skill, professional Knowledge, and Employability Skill related to job role. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered in one year duration are as below:

The trainee learns about safety and environment, use of fire extinguishers, artificial respiratory resuscitation to begin with. They get the idea of basic computer operation to generate 3D model. This includes construction of geometrical figures using drawing instruments, procedure to prepare a drawing sheet as per SP-46:2003. After becoming familiar with basic drafting terminology, students begin to develop multi-view drawings and learning about projection methods, auxiliary views and section views. Lettering, tolerance, metric construction, technical sketching and orthographic projection, isometric drawing, oblique and perspective projection are also covered. Generate detailed and assembly views with dimensions, annotations, in 3D Modeling software, print preview to plot in .dwg and .pdf format. In Manufacturing Technology includes making job as per specification with power tool operation, different complex assembling and fitting, fastening, lapping, making gauges and check for functionality. In electrical & electronics part trainees identify the basic functioning of electrical and electronics equipment used in industrial applications. In addition to maintenance work of 3D printing machine they perform to check the desired accuracy of the components.

The Trainees learn to design and develop prototype/ end use product for Additive Manufacturing (AM) viz., Bracket/ Lever, Clamp, Spur Gear, threaded components etc. by extrusion (FFF Technology) and photo-polymerization (SLA)/ PLA technology. They learn to design and analysis of fixtures and various composite materials, aesthetic models and suggest optimization process. In addition, they carry out maintenance i.e. disassembling and assembling of AM machines, application of process algorithm of Slicing Software, application of post processing techniques to finish job, scanning techniques and processing of scan data to create parametric model.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of the economy / labor market. The Vocational Training Programmes are delivered under the aegis of the Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer Programmes of DGT for propagating vocational training.

CTS courses are delivered nationwide through network of ITIs. The course 'INDUSTRIAL INTERNET OF THINGS (IIoT) TECHNICIAN' is of one-year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory and Trade Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill, knowledge and life skills. After passing out of the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainee broadly needs to demonstrate that they are able to:

- Read and interpret technical parameters/ documentation, plan and organize work processes, identify necessary materials and tools.
- Perform tasks with due consideration to safety rules, accident prevention regulations and environmental protection stipulations.
- Apply professional knowledge & employability skills while performing the job and modification & maintenance work.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as IIoT Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship Programmes in different types of industries leading to a National Apprenticeship Certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming an instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

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

S No.	Course Element	Notional Training Hours	
		1st Year	2nd Year
1	Professional Skill (Trade Practical)	840	840
2	Professional Knowledge (Trade Theory)	240	300
3	Employability Skills	120	60
	Total	**1200**	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

On the Job Training (OJT)/ Group Project	150	150
Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240	240

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal)during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final**

assessment. The examiner during final examination will also check individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted while for formative assessment:

Performance Level	Evidence
(a) Marks in the range of 60%-75% to be allotted during assessment	

For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Marks in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Marks in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

The Industrial Internet of Things (IIoT) Technician focuses on the use of interconnected devices, systems such as microcontroller, software, sensor, actuators, and other accessories for connectivity to improve efficiency, productivity, safety in industrial processes and reducing human efforts.

IIoT Technician will work on Installation, configuration and troubleshooting of IIoT systems related to various domains such as automobile, smart agriculture, asset tracking, industrial automation, robotics, fire safety in Industrial environment etc.

IIoT Technician innovates basic solutions using various electronic devices and software to develop real time monitoring of pulse rate, temperature, humidity, and other parameters.

IIoT Technician Job role includes:

- Promote a safe working environment for yourself and colleagues.
- Interface with basic input/output devices.
- Trace the circuit paths on the printed circuit boards and perform tests with multimeter to troubleshoot any faults in digital circuits.
- De-solder faulty / damaged circuit components where necessary and replace them with tested components by soldering.
- Install and configure readily available software systems for interconnectivity of different digital systems.
- Work on assembly of various components as per specifications.
- Understands and implements network connectivity, using best suited network topology in the work environment and maintaining it.
- Use suitable protocol for communication between hardware devices and software to transfer data over the network and communication media.
- Use of open-source cloud platform for IIoT application.
- Test network connectivity to identify and report the errors or issues with proper description in the network to the technical team for network management.
- Programs basic instruction for controllers to perform required activity and simulate them over open-source platforms.
- Build simple applications based on code blocks to create user interface to operate IIoT device remotely during product development and product testing phase.
- Installing and configuring sensors, devices, and networking equipment in industrial settings.
- Conducting maintenance, calibration, and troubleshooting of IIoT hardware.
- Monitoring IIoT systems in real-time.
- Assist in IIoT application Development using Machine Learning and Data Analytics.
- Build IIoT application for various domains such as health monitoring service,

automobiles, agricultural etc.

- Install, set up, and configure PLCs and SCADA systems based on project requirements.
- Design and develop SCADA systems for real-time monitoring and control.
- Design projects using Human-Machine Interfaces (HMIs) for intuitive interaction with industrial processes.
- Identify and resolve issues with PLCs, SCADA, and HMI.
- Conduct routine maintenance to ensure the reliability and efficiency of the systems.
- Identifying and addressing issues or anomalies.
- Providing technical support to end-users and clients.
- Design applications for real-time statistical analysis.
- Resolving technical issues related to IIoT systems.
- Offering guidance and troubleshooting assistance over the phone or on-site.
- MES (Manufacturing Execution System) support technician.
- Support in R&D using innovative ideas to solve day to day problems.

In addition, Industrial Internet of Things (IIoT) Technician should have the ability to understand job requirements, coordination with different teams and should have positive attitude to perform assigned work.

Information and Communications Technology Installers and Servicers, Other; 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

NOSs:

SSC/N9530, SSC/N9531, SSC/N9532, SSC/N9533, SSC/N9534, SSC/N9535, SSC/N9536, SSC/N9537, SSC/N9538, SSC/N9539, SSC/N9540, SSC/N9541, SSC/N9542, SSC/N9543, SSC/N9544, SSC/N9545, SSC/N9546, SSC/N9547, SSC/N9548, SSC/N9549, SSC/N9550, SSC/N9551, SSC/N9552, SSC/N9552, SSC/N9553, SSC/N9553, SSC/N9554, SSC/N9554, SSC/N9555, SSC/N9556, SSC/N9557

4. GENERAL INFORMATION

Name of the Trade	**INDUSTRIAL INTERNET OF THINGS (IIOT) TECHNICIAN**
NCO – 2015	7422.9900
NOS Covered	SSC/N9530, SSC/N9531, SSC/N9532, SSC/N9533, SSC/N9534, SSC/N9535, SSC/N9536, SSC/N9537, SSC/N9538, SSC/N9539, SSC/N9540, SSC/N9541, SSC/N9542, SSC/N9543, SSC/N9544, SSC/N9545, SSC/N9546, SSC/N9547, SSC/N9548, SSC/N9549, SSC/N9550, SSC/N9551, SSC/N9552, SSC/N9552, SSC/N9553, SSC/N9553, SSC/N9554, SSC/N9554, SSC/N9555, SSC/N9556, SSC/N9557
NSQF Level	Level - 4
Duration of Craftsmen Training	Two Years (2400 Hours + 300 Hours OJT/Group Project)
Entry Qualification	Passed 10th Class Examination with Science and Mathematics or its equivalent
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF, AUTISM, SLD
Unit Strength (No. Of Student)	20 (There is no separate provision of supernumerary seats)
Space Norms	125 Sq. m
Power Norms	5 KW
Instructors Qualification for	
(i) Industrial Internet of Things (IIoT) Technician Trade	B. Voc/Degree in Electronics/ Electronics and Communication /Electrical / Instrumentation/ Mechatronics/Computer Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Electronics/ Electronics and Communication /Electrical / Instrumentation/ Mechatronics/Computer Engineering from AICTE recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/NAC passed in the Trade of "Industrial Internet of Things Technician" With three years' experience in the relevant field.

	<u>Essential Qualification</u>: Relevant National Craft Instructor Certificate (NCIC) in any of the variants under DGT. ***Note: Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.***
(ii) Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with **short term ToT Course in** Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) OR **Existing Social Studies Instructors in ITIs with short term ToT Course in** Employability Skills.
(iv) Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOME

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

5.1 LEARNING OUTCOMES

FIRST YEAR:

1. Handle and maintain various electronic instruments like voltmeters, ammeters, etc. and identify the basic electronic and electrical components. (NOS: SSC/N9530)
2. Demonstrate characteristics of various electrical, electronic components, and explore digital electronic systems. (NOS: SSC/N9531)
3. Identify basic electronics components & PCB. (NOS: SSC/N9532)
4. Demonstrate the use of different types of digital sensors and analog sensors for various applications. (NOS: SSC/N9533)
5. Demonstrate basic C programming instructions required for IIoT application. (NOS: SSC/N9534)
6. Familiarization with microcontroller, its architecture, microcontrollers viz., Arduino boards and explore the different commands used in microcontrollers platform. (NOS: SSC/N9535)
7. Demonstrate the application of single board computers (SBCs). (NOS: SSC/N9536)
8. Interface microcontrollers with sensors, actuators, and communication modules for connecting IIoT systems. (NOS: SSC/N9537)
9. Apply the knowledge of network protocols, data transmission methods, open-source cloud integration and APIs for IIoT applications. (NOS: SSC/N9538)
10. Demonstrate different types of open-source databases and explore multiple operations associated with data used for building IIoT applications. (NOS: SSC/N9539)
11. Explore the technicalities like edge devices, gateways, open-source cloud platforms and Wi-Fi module for establishing connectivity between IIoT devices and open-source cloud platforms. (NOS: SSC/N9540)
12. Demonstrate basics of python programming for IIoT application. (NOS: SSC/N9541)
13. Program Raspberry Pi using Python editor and interface with peripherals for IIoT applications. (NOS: SSC/N9542)
14. Develop and deploy mobile and Web application for IIoT using open-source platforms. (NOS: SSC/N9543)
15. Program and interface IIoT devices to build IIoT applications. (NOS: SSC/N9544)
16. Explore security and privacy challenges associated with IIoT systems. (NOS: SSC/N9545)

SECOND YEAR:

17. Explore ML, python module like pandas, NumPy, etc. (NOS: SSC/N9546)
18. Build impactful data visualizations using Matplotlib in Python. (NOS: SSC/N9547)
19. Demonstrate use of machine learning in IIoT. (NOS: SSC/N9548)
20. Demonstrate different types of IIoT Data Analytics. (NOS: SSC/N9549)
21. Implement ML, CV (computer vision) and data analytics by using hardware. (NOS: SSC/N9550)
22. Execute ML, AI, and data analytic python programs on Raspberry Pi/IoT Gateway and monitor through Web/ mobile application. (NOS: SSC/N9551)
23. Demonstrate programmable logic control, its application, selection criteria and types. (NOS: SSC/N9552)
24. Demonstrate handling of open-source PLC programming software and explain addressing input / output devices. (NOS: SSC/N9552)
25. Write simple PLC programs using ladder diagram to understand basic logic. (NOS: SSC/N9553)
26. Explore ladder programming examples on Timers, Counters, and comparators. (NOS: SSC/N9553)
27. Interface open PLC with Arduino nano and explain with examples. (NOS: SSC/N9554)
28. Interface open PLC with raspberry pi and explain with examples. (NOS: SSC/N9554)
29. Demonstrate and configure HMI (using open-source software) and explore programming for designing applications. (NOS: SSC/N9555)
30. Familiarize with the Significance of Industry 4.0. (NOS: SSC/N9556)
31. Develop solutions for interfacing PLC, SCADA programs with cloud platforms for IIoT applications. (NOS: SSC/N9557)

6. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
FIRST YEAR	
1. Handle and maintain various electronic instruments like voltmeters, ammeters, etc. and identify the basic electronic and electrical components. (NOS: SSC/N9530)	Handle equipment and tools like voltmeters, ammeters for measuring electrical quantities.
	Use and maintain pliers.
	Use and maintain clamps, drills, tester.
	Use and maintain soldering tool.
	Classification of material as conductor, semiconductor, insulators, superconductors.
	Identification of different electrical and electronic components.
	Classification of components based on active and passive components electromechanical components.
	Types of each basic electronic component (resistor, capacitor, diode, transistor).
	Demonstrate working principle of each basic electronic component.
2. Demonstrate characteristics of various electrical, electronic components, and explore digital electronic systems. (NOS: SSC/N9531)	Demonstrate voltage current resistance and capacitance.
	Ohms law current and voltage analysis, ohmic and non ohmic devices
	Power in electrical circuits is due to current, voltage and resistor.
	Read datasheet for component and understand power rating of each component.
	Demonstrate the fundamentals of digital electronics.
	Identify common components and demonstrate functionality of transistor and integrated circuits (ICs).
	Demonstrate Boolean algebra and logic design to achieve specific functions.
3. Identify basic electronics components & PCB. (NOS: SSC/N9532)	Measure AC and DC voltage & current
	Perform an electronic circuit for any application
	Measure and calculate power in RLC circuit.

4. Demonstrate the use of different types of digital sensors and analog sensors for various applications. (NOS: SSC/N9533)	Identify sensors for required projects or circuits by referring to its data sheet or manual.
	Adjust sensors sensitivity.
	Measure output of given PIR sensor, IR Sensor etc.
5. Demonstrate basic C programming instructions required for IIoT application. (NOS: SSC/N9534)	Demonstrate of variable, datatypes, identifier- constant and keywords, operators.
	Use of loops, control statements and types of function in programming
	Present the concept of embedded system and open-source software (debugger, Compiler, Assembler, Interpreter etc.).
6. Familiarization with microcontroller, its architecture, microcontrollers viz., Arduino boards and explore the different commands used in microcontrollers platform. (NOS: SSC/N9535)	Identify the microcontroller families.
	Identify parts of microcontroller CPU, ALU and GPIO.
	Demonstrate parts of microcontroller Timer, Counter.
	Demonstrate Serial Interface of microcontroller.
	Demonstrate interrupt of microcontroller.
	Use of Memory unit.
	Using ADC and DAC for analog to digital and digital to analog signal conversion respectively.
	Download and install open-source Arduino software.
	Sensor interfacing with Arduino.
	Program Arduino to have hands on experience of all basic commands.
7. Demonstrate the application of single board computers (SBCs). (NOS: SSC/N9536)	Demonstrate and set up of Single Board Computers
	Install an open-source Operating System on Raspberry Pi - Getting Started with Raspberry Pi Setup
	Demonstrate SBC as a Web Server & different IoT application.
	Exhibit SBCs in Robotics Application (Servo motor)
8. Interface microcontrollers with sensors, actuators, and communication modules for connecting IIoT systems. (NOS: SSC/N9537)	Interface digital Sensor to microcontroller.
	Interface different types of analog sensor to microcontroller.
	Interface actuators, relay, etc. output devices to microcontroller.
	Interface different types of communication module to

	microcontroller like Bluetooth, Wi-Fi, etc.
9. Apply the knowledge of network protocols, data transmission methods, open-source cloud integration and API for IIoT applications. (NOS: SSC/N9538)	Demonstrate the concept of IIoT
	Demonstrate 4-layer IIoT architecture.
	Demonstrate get, put, post, and delete request using Postman tool.
	Explore real time examples in IOT.
	Write program to extract data/information from open-source weather API's.
	Demonstrate Network devices Switch, router, hub.
	Demonstrate Network topologies line, star, mesh etc..
10. Demonstrate different types of open-source databases and explore multiple operations associated with data used for building IIoT applications. (NOS: SSC/N9539)	Demonstrate to IIoT and Data Management.
	Overview of Database Types.
	Database Characteristics and Suitability.
	Comparative Analysis of Database Types.
	Ethical Considerations in IIoT Data Management.
11. Explore the technicalities like edge devices, gateways, open-source cloud platforms and Wi-Fi module for establishing connectivity between IIoT devices and open-source cloud platforms. (NOS: SSC/N9540)	Demonstrate High Power Consumption, High Range, High Bandwidth.
	Demonstrate Low Power Consumption, Low Range, High Bandwidth.
	Demonstrate Low Power Consumption, High Range, Low Bandwidth.
	Demonstrate Cellular connectivity to hardware and cloud.
	Demonstrate Wi-Fi Connectivity to hardware and cloud.
	Demonstrate Ethernet Connectivity to hardware and cloud.
	Demonstrate Data collection, storage, and data management
	Demonstrate the concept of cloud/ Virtual Storage.
	Add Wi-Fi module libraries in Arduino IDE.
	Demonstrate Wi-Fi module structure and basic commands.
	Connect Wi-Fi module to Wi-Fi router using programming.
	Interface sensor to Wi-Fi module.
	Post sensor(s) data to web server or cloud.

12. Demonstrate basic python programming for IIoT application. (NOS: SSC/N9541)	Demonstrate basics in python language
	Demonstrate object-oriented programing in python.
	Demonstrate code efficiency and optimization
	Problem-solving and algorithm design
	Demonstrate code readability and style
	Demonstrate error handling and debugging
13. Program Raspberry Pi using Python editor and interface with peripherals for IIoT applications. (NOS: SSC/N9542)	Demonstrate Raspberry Pi Processor.
	Demonstration of PIN configuration, memory, graphic, Ethernet and USB ports.
	Install operation system.
	Interface sensors to Raspberry pi.
	Remote connectivity configuration.
	Install editors and other software.
	Send data from sensors over the internet.
14. Develop and deploy android and Web application for IIoT using open-source platforms. (NOS: SSC/N9543)	Design user interface in web application and android application.
	Demonstrate the use of palette, viewer, components property.
	Design and develop logic and flow for android application and web application.
	Make app backend using block codding.
	Build and test the android application.
15. Program and interface IIoT devices to build IIoT applications. (NOS: SSC/N9544)	Make analysis and choose required sensors for industrial automation depending on the problem statement.
	Implement different types of sensors like voltage sensor, current sensor, relay, water-level, air-quality, fire, vibration, temperature, current, IR, RFID, LDR etc.
	Interface and measuring values with help of required sensors tools and serial monitors.

	Ensure data is loaded to the cloud or other virtual database and test it using tools like postman or dedicated user interface.
	Ensure the output devices interface is working for any changes provided by cloud or remote access.
16. Explore security and privacy challenges associated with IIoT systems. (NOS: SSC/N9545)	Demonstration of IoT Protocols (MQTT, CoAP, HTTP, HTTPS).
	Machine to Machine(M2M) communication and Internet of things
	Demonstrate of Cloud services – SaaS, PaaS, IaaS
	Interpret different IoT types of attacks.
	Security: Recognize IoT security and vulnerability threats.
	Demonstrate preventive measures for attacks and security.
	Demonstrate device management and firmware update.
Second Year	
17. Explore ML, python module like pandas, NumPy, etc. (NOS: SSC/N9546)	Identify Python Libraries
	Explore NumPy array.
	Create NumPy array and array methods.
	Demonstrate Pandas module.
	Create pandas' series and apply different types of method like short, filter, etc.
18. Build impactful data visualizations using Matplotlib in Python. (NOS: SSC/N9547)	Demonstrate use of data visualization.
	Demonstrate use of matplotlib library.
	Demonstrate use of types of plots – line plot, bar plot, pie chart, etc.
	Customize axes labels and titles.
19. Demonstrate use of machine learning in IIoT. (NOS: SSC/N9548)	Demonstrate use of machine learning in IIoT.
	Demonstrate use of regression in ML
	Distinction between linear and nonlinear regression.
	Demonstrate use of regression for prediction.
20. Demonstrate different types of IIoT Data Analytics. (NOS: SSC/N9549)	Demonstrate use of data analytics and its applications.
	Identify role of data analytics in industry.
	Demonstrate data cleaning and handling.
	Demonstrate types of IIoT Data Analytics- Descriptive Analytics,

	Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics.
21. Implement ML, CV (computer vision) and data analytics by using hardware. (NOS: SSC/N9550)	Demonstrate of computer vision (CV).
	Demonstrate basic of image processing and computer vision.
	Identify application of computer vision in IoT and embedded system.
	Identify image processing techniques.
22. Execute ML, AI, and data analytic python programs on Raspberry Pi/IoT Gateway and monitor through Web/ mobile application. (NOS: SSC/N9551)	Demonstrate importance of image classification
	Identify applications of ML in various domain e.g., healthcare, autonomous vehicle, agriculture, etc.
	Demonstrate basic digital image processing and pixel representation.
	Explore different open-source AI, ML modules.
23. Demonstrate programmable logic control and its application, selection criteria and types. (NOS: SSC/N9552)	Demonstrate the basics of Programmable logic device and different terminal and their uses.
	Explain the communication port in PLC.
	Demonstrate working principle of input and output module and their uses.
	Complete demonstration of PLC applications.
24. Demonstrate handling of open-source PLC programming software and explain addressing input/output devices. (NOS: SSC/N9552)	Demonstrate the downloading and installation and opening process of open-source PLC programming software.
	Demonstrate the addressing concept used in plc programming and understand the toolbar with drag and drop option to choose a particular item for programming PLC.
	Demonstrate the basic instruction used to create programs in ladder diagram
25. Write simple PLC programs using ladder diagram to understand basic logic. (NOS: SSC/N9553)	Create ladder diagrams for small applications with basic instruction and check the results.
	Create ladder diagrams for all logic gates and check results.
	Demonstrate communication method and protocols used in PLC.
	Offline and online edit the PLC Program.

26. Explore ladder programming examples on Timers, Counters, and comparators. (NOS: SSC/N9553)	Develop basic ladder logic programs that address both time-based and event-based control requirements.
	Develop practical ladder logic examples involving timers, counters, and comparators and demonstrates creativity and relevance in the choice of examples.
	Implement ladder logic solutions for scenarios such as motor control, conveyor systems, batch processing, etc.
	Demonstrates the ability to troubleshoot ladder logic programs involving timers, counters, and comparators.
27. Interface open PLC with Arduino nano and explain with examples. (NOS: SSC/N9554)	Establish communication between the open PLC and Arduino Nano.
	Utilizes appropriate communication protocols for interfacing.
	Write clear and well-commented code for interfacing.
	Integrates both analog and digital signals in the interfacing examples.
	Build programming examples that cover various scenarios of practical significance.
28. Interface open PLC with raspberry pi and explain with examples. (NOS: SSC/N9554)	Successfully establishes communication between the open PLC and Raspberry pi.
	Utilizes appropriate communication protocols for interfacing.
	Demonstrates different use cases such as sensor data exchange, control signals, etc.
	Develop ladder logic programming examples on industry practices.
29. Demonstrate and configure HMI using open-source software) and explore programming for designing applications. (NOS: SSC/N9555)	Demonstrate the features of HMI and its applications.
	Demonstrate the programming platform used for designing projects.
	Demonstrate connection and communication protocol for HMI and PLC.
	Design multiple projects using open-source HMI software platforms.
30. Familiarize with the Significance of Industry 4.0	Demonstrate basic concept of Digital Twin
	Perform and execute of SMART FACTORY

(NOS: SSC/N9556)	Familiarize with the concept ROBOTICS
	Make acquainted with the concept 3D PRINTING
31. Develop solutions for interfacing PLC, SCADA programs with cloud platforms for IIoT applications. (NOS: SSC/N9557)	Integrate PLC ladder and SCADA programs with open-source cloud platforms.
	Utilize standardized communication protocols for PLC and SCADA cloud integration.
	Enables real-time data streaming from open-source PLC and open-source SCADA systems to the cloud.
	Monitor inputs and controlling different actuators from open-source cloud platform.

7. TRADE SYLLABUS

SYLLABUS FOR INDUSTRIAL INTERNET OF THINGS (IIOT) TECHNICIAN TRADE			
FIRST YEAR			
Duration	**Reference Learning outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 1 :** Handle and maintain various electronic instruments like voltmeters, ammeters, etc. and identify the basic electronic and electrical components.	1. Importance of trade training, List of tools & Machinery used in trade. 2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). 3. First Aid Method and basic training. 4. Safe disposal of waste materials like cotton waste, metal chips/burrs etc. 5. Hazard identification and avoidance. 6. Safety signs for Danger, Warning, caution & personal safety message. 7. Preventive measures for electrical accidents & steps to be taken in such accidents. 8. Use of Fire extinguishers. 9. Practice and understand precautions to be followed while working in fitting jobs. 10. Safe use of tools and equipment used in the trade. 11. Use and maintain pliers. 12. Use and maintaining soldering tool. 13. Handle equipment and tools like voltmeters, ammeters for measuring electrical quantities. 14. Identify and Test materials	• All necessary guidance to be provided to the newcomers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills, their importance and Job area after completion of training. • Importance of safety and general precautions observed in the industry/shop floor. • Introduction of First aid. Operation of electrical mains and electrical safety. Introduction of PPEs. Response to emergencies e.g., power failure, fire, and system failure. • Importance of housekeeping & good shop floor practices. Introduction to 5S concept & its application. • Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. Basic understanding on Hot work, confined space work and material handling equipment. • Understanding basic terms like electric charges, Potential difference, Voltage, Current, Resistance. Basics of

		as conductor insulator and semiconductor. 15. Identify and make a list of different electrical and electronic components. 16. Identify and make a list of symbols for electrical and electronic components. 17. Identify and make a list of active components such as battery, generator, transistor etc. 18. Identify and make a list of passive Components such as capacitor, Resistor, Inductor etc. 19. Identify and make a list of Electromechanical components. 20. Demonstration of basic electrical and electronic components like Resistor, inductor, capacitor, diode, etc. 21. Identify and make a list of different types of resistors and their applications. 22. Identify and make a list of different types of capacitors and their applications.	AC & DC. Various terms such as +ve cycle, -ve cycle, Frequency, Time period. • study equipment and tools like voltmeters, ammeters for measuring electrical quantities. • study and maintaining pliers. • study and maintaining crimping tools. • study and maintain clamps, drills, tester. • study and maintaining soldering tool. Understanding conduction band, valance band and forbidden gap. • Understanding of Conductor material, insulator material. Semiconductor material. • Difference between conductor, insulator, and semiconductor. • Understanding of basic of electricity, current, voltage, Potential difference, Resistance, AC & DC. • Classification of cables according to gauge (core size), number of conductors, material, insulation strength, flexibility etc. • Understand different electrical and electronic components and their function. • Understanding different electrical and electronics symbol. • Understanding of components based on active and passive components electromechanical components.

			• Classification of components based on active and passive components. • Fundamental working principle of each basic electronic component. • Introduction to Resistors; types of resistors, their construction & specific use. Working principal of resistor and its applications. • Understanding of capacitor and types of capacitors. Working principal of capacitor and its applications.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 2 :** Demonstrate characteristics of various electrical, electronic components, and explore digital electronic systems.	23. Demonstrate transistor, its types, and characteristics. 24. Implement Resistor in circuit and analyze output characteristics. 25. Implement diode in circuit and analyze output characteristics. 26. Implement capacitor in circuit and analyze output characteristics. 27. Plot voltage and current values for diode. 28. Demonstrate half wave Rectifier and its characteristic in simulator. 29. Demonstrate full wave Rectifier and its characteristics in simulator. 30. Compare Full wave rectifier and Half wave rectifier. 31. Demonstration of digital signals and binary number system in electronic industry. 32. Demonstration of Boolean algebra used in digital electronics. 33. Identify logic gates	• Understanding of transistors and types of transistors. Working principal of transistor. • Voltage and current Regulation. • Understanding ohmic and non ohmic elements. • Difference between ohmic and non ohmic elements. • Understanding and application of ohms' law. • Characteristics and application of resistor. • Characteristics and application of capacitor. • Understanding of diode and its characteristics. • Characteristics and application of transistor. • Study full wave and half wave rectifier. • Introduction to digital electronics. • Understanding binary number system.

		34. Demonstrate and verify logic gates – AND, OR, NOT, XNOR, NAND, NOR etc. In simulator. 35. Demonstrate use case of logic gates in industries.	• Understanding Boolean algebra. • Study basic logic gates – AND, OR, NOT, XNOR, NAND, NOR etc. • Understanding logic gates truth table.
Professional Skill 25 Hrs. Professional Knowledge 05 Hrs.	**L.O. - 3 :** Identify basic electronics components & PCB.	36. Measure AC and DC voltage & current. 37. Make an electronic circuit for any application and place resistor, capacitor and inductor in series and verify the voltage values. 38. Make an electronic circuit for any application and place resistor, capacitor, and inductor in Parallel and verify the voltage values. 39. Measure and calculate power in RLC circuit. 40. Explore options to detect faults in various electronic circuits using multimeter. 41. Repair Circuit based on faults and replaced components with new ones if needed.	• Understanding DC voltage and AC voltage. • Understanding single phase and three phase power supply. • Understanding parallel and Series circuit combination of basic electronics components. • Study current in parallel and series circuit. • Study voltage in parallel and series circuit. • Measuring resistor value using respective measuring instruments and by mathematical calculations, color code marked, or numeric figure printed on respective component. • Measuring capacitor value using respective measuring instruments and by mathematical calculations, color code marked, or numeric figure printed on respective component. • Measuring inductor value using respective measuring instruments and by mathematical calculations, color code marked, or numeric figure printed on respective component. • Understanding of power in electrical circuits and unit of power.

			• Power dissipation due to resistor. • Understanding troubleshooting faults in electronic circuits. • Selecting suitable solder gun for application. • Using and handling solder guns from various angles for various sections and planes of PCB. • Magnifier for soldering SMD components manually. • Using appropriate flux material, solder for soldering and de-soldering IC Base, semiconductor components (resistor, capacitor, inductor, transistor etc.).
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 4 :** Demonstrate the use of different types of digital sensors and analog sensors for various applications	42. Identify and make a list of sensors available in the center viz. temperature, humidity, motion, flow, pressure, moisture etc.. 43. Identify and compare active sensors and passive sensors. 44. Identify industrial applications of various sensors. 45. Adjust sensors sensitivity using potentiometer. 46. Measure and test voltage values for IR sensor. 47. Measure and test voltage values for LDR sensor (Light sensor). 48. Measure and test voltage values for PIR sensor. 49. Measure and test voltage values for soil Moisture sensor.	• Understanding of digital sensor. • Understanding of analog sensor. • Difference between analog and digital sensor. • Calibrating sensor physically. • Understanding of active sensor. • Understanding of passive sensor. • Difference between active and passive sensor. • Understanding and working of IR sensor. • Understanding and working of LDR sensor. • Understanding and working of PIR sensor. • Understanding and working of water level sensor. • Understanding and working of sound sensor.
Professional Skill 45 Hrs.	**L.O. - 5 :** Demonstrate basic	50. Identify and make a list of IOT software / open-source	• Introduction and understanding of basic C.

Professional Knowledge 15 Hrs.	C programming instructions required for IIoT application.	platforms used for development of IOT applications. 51. Demonstrate basics in C language. 52. Demonstrate commands in C language. 53. Write a program to print text in C. 54. Write a program to store a variable and the print variable on screen. 55. Write a program using different data types. 56. Write a program using operators. 57. Write a program using if else. 58. Write a program using if else and if else ladder. 59. Write program using nested if else. 60. Write program using for loop. 61. Write program using do while loop. 62. Write app program using while loop 63. Write programs with different types of functions.	• Introduction and understanding of debugger. • Introduction and understanding of compiler. • Introduction and understanding of Editor. • Understanding of variables. • Understanding of data types. • Understanding of identifiers. • Understanding of logical operators. • Understanding of Arithmetic operators. • Understanding of relational operators. • Understanding of decision-making statements - If statement -If else statement, If else if statement, Switch case statements. • Understanding of loop statements – While loop, Do while loop, For loop. • Introduction to embedded system software (debugger, Compiler, Assembler, Interpreter etc.).
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 6 :** Familiarization with microcontroller, its architecture, Microcontrollers viz. Arduino boards and explore the different commands used in Microcontrollers platform.	64. Identify and make a list of microcontrollers based on family (IC number, BIT number). 65. Compare any two microcontrollers. 66. Select microcontrollers based on applications, data transfer rate, data type, number of devices to be connected etc. 67. Identify and make a list of important components on microcontroller development board. 68. Identify and make a list of	• study microcontroller families. • Understand parts of microcontroller CPU, ALU and GPIO. • Understand parts of microcontroller Timer, Counter. • Understand Serial Interface of microcontroller. • Understanding interrupt of microcontroller. • Understanding Memory unit. • Using ADC and DAC for analog to digital and digital

		the use of each pin of microcontroller. 69. Draw general architectural layout for microcontroller. 70. Identify and utilize different input and output devices in electronic circuits. 71. Demonstration of Arduino board with applications in IIoT. 72. Download open-source Arduino IDE and installing it. Create a new project and compile and upload to microcontroller. 73. Write a program using pin Mode command. 74. Write a program using digital read command. 75. Write program using digital Read command. 76. Write a program using delay command. 77. Write a program using analog Read command. 78. Write a program using analog Write Command. 79. Write a command using Serial begin and SerialWrite command. 80. Demonstrate a simple (LED Blink) program and upload it on microcontroller and interface with electronic circuit consisting of Led, resistor and switch.	to analog signal conversion respectively. • Understanding of Input devices like Switch, Sensor etc. • Understanding of output devices like bulb, display, led, relay etc. • Downloading and Installing Arduino software. • Handling of Arduino IDE. • Create new project. • Compile the project. • Upload the project. • Save the project. • Basic Arduino sketch. • Understanding of void setup () function. • Understanding of void loop () function. • Understanding of basic commands like - pin Mode, digitalRead, digitalWrite, analogWrite, analog Read, delay etc.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 7 :** Demonstrate the application of single board computers (SBCs).	81. Demonstrate Single Board Computers. 82. Set-up and configuring SBCs. 83. Explore Raspberry Pi as a versatile Single-Board Computer for Electronics, Programming, and IoT Applications. 84. Install an open-source	• Basics of Computer Architecture. • Introduction to operating systems for SBCs. • Understanding GPIO and hardware interfacing. • Understanding communication protocols for

		Operating System on Raspberry Pi - Getting Started with Raspberry Pi Setup. 85. Demonstrate General Purpose Input-Output (GPIO) Programming and Hardware Interfacing. 86. Demonstrate SBC as a Web Server. 87. Demonstrate SBC in IoT Applications. 88. Demonstrate SBC as a Media Center. 89. Demonstrate SBCs in Robotics Application (Servo motor). 90. Demonstrate SBC in Home and Industry Automation Application.	SBCs. • Understanding power management and Supply. • Understanding network connectivity, security, and privacy in SBCs.
Professional Skill 85 Hrs. Professional Knowledge 20 Hrs.	**L.O. - 8 :** Interface microcontrollers with sensors, actuators, and communication modules for connecting IIoT systems.	91. Write a program to Flash Four LEDs Using microcontrollers viz. Arduino. 92. Write a program to change LED brightness using Pulse width modulation (PWM). 93. Create interface of DHT11 and Arduino microcontroller. 94. Write a Program for DHT11 sensor in Arduino and implement adding zip libraries for DHT11 sensor. 95. Use DHT11 to build a simple circuit to monitor temp and humidity. 96. Interface of gear motor with microcontroller viz. Arduino to monitor and control rpm. Also demonstrate the output on serial monitor. 97. Write a program for interfacing gear motor in Arduino to control direction of motor rotation.	• Understanding external libraries for devices. • Adding open-source libraries for devices using Arduino library manager. • Adding open-source libraries for devices using zip file. • Understanding of hardware communication of Arduino. • Understanding Serial Communication of Arduino. • Sensor interfacing of Arduino. • Understanding Data Transfer (Wireless). • Understanding factors associated with data for IIoT communication such as: Types of Data (Text, image, video, numeric, audio etc.) Device used, Technology, No. of devices connected, rate of data transfer, data size etc.

		98. Interface Light Depending Resistor (LDR) to Arduino Microcontroller to switch ON & OFF bulb or any other electronic device. 99. Write a program of interfacing Liquid crystal display (LCD) with Arduino microcontroller to display sensor data. 100. Interface servo motor to Arduino microcontroller to change the angular position of robot arm. 101. Interface stepper motor to Arduino microcontroller to change the rpm and direction. 102. Write a program to interfacing infrared (IR) sensor with Arduino microcontroller to detect obstacles. 103. Write a program of interfacing Ultrasonic sensor with Arduino microcontroller to calculate distance. 104. Interface Bluetooth with Arduino to control the speed of the motor. 105. Write a program to create Serial communication between Arduino, Wi-Fi, and ultrasonic sensor to measure the level of water tank. 106. Demonstration of components used in developing vehicle trackers system using GPS. 107. Write a program to interface Global Positioning System (GPS) and Global System for Mobile communication (GSM) for vehicle tracking system.	• Demonstration of transferring data using: Bluetooth, Wi-Fi, LAN, MAN, WAN, LoRa, GPS, etc. (17 hrs.)

		108. Test and corelate the vehicle tracking system with physical data. 109. Automatic Door Open using passive infrared sensor (PIR) motion sensor. 110. Build temperature Based Fan Control and Monitoring system using Arduino. 111. Build and develop automated plant watering system using water sensor or soil moisture sensor and solenoid. 112. Control bulb or any electrical Devices using relay and microcontroller. 113. Build and develop smart dustbin opening using Arduino servo motor and ultrasonic sensor. 114. Develop Arduino based traffic light simulator. 115. Develop alcohol Sensing and engine lock system using microcontroller.	
Professional Skill 60 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 9 :** Apply the knowledge of network protocols, data transmission methods, open-source/ cloud integration and API for IIoT applications.	116. Explore bus topology devices through a practical approach. 117. Explore star topology devices through a practical approach. 118. Explore Connection of switch to devices. 119. Explore Connection of IoT Gateway to devices. 120. Gain practical experience in using and understanding the command prompt. 121. Explore network Information Using the IP Command. 122. Troubleshoot Network using Ping command and TRACERT command.	• Introduction to functional block diagram of IIoT. • Topology • Understanding the concept of cloud/ Virtual Storage open source. • Industrial and commercially available cloud services. • Real time examples in IOT. • Understanding of IoT Architecture (Data gathering, Data Transmission, Process Information, Smart Application) • Understanding of IoT layers. • Understanding concept of API's. • Introduction to different

		123. Use HTTP protocol to get internet access for microcontroller. 124. Observe Real time examples of Industrial Internet of Things provided by open-source APIs and make analysis. 125. Demonstrate get, put, post, and delete request using Postman tool. 126. Write a program to extract data/information from open-source weather API's and use that data for different projects. 127. Connect Gateway to the cloud using protocols such as MQTT, CoAP, HTTP, HTTPS etc. 128. Push data to the cloud.	commands like get, put, post, delete for postman tool. • Understanding of application layer. • Understanding of network layer • Understanding of processing layer. • Understanding of Sensor and actuator Layer. • Study of Network Devices - Switch, router, hub. • Study of Network topologies - line, star, mesh etc. • Understanding of IoT Protocols (MQTT, CoAP, HTTP, HTTPS).
Professional Skill 60 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 10 :** Demonstrate different types of open-source databases and explore multiple operations associated with data used for building IIoT applications.	129. Practical exercises involving data preprocessing tasks, such as filtering noise, handling missing values, and normalizing data. 130. Hands-on experience with open-source / cloud storage services and data retrieval using APIs. 131. Implementation of operations like Create, Read, Update and Delete (CRUD) operations and queries on IIoT datasets. 132. Analyze real-world IIoT data challenges and implement database solutions. 133. Demonstration of practical	• Introduction to data management concepts, including data collection, storage, processing, and analysis. • Discussion on the role of data in optimizing industrial operations and enhancing efficiency. • Exploration of the data lifecycle stages: data acquisition, preprocessing, storage, analysis, visualization. • Overview of data formats (JSON, XML, CSV) and communication protocols (MQTT, CoAP) commonly used in IIoT. • Brief overview of key database types tailored for

		exercises which involve assessing data collection methods, identifying sensitive information.	IIoT scenarios like- relational, NoSQL, time-series, in-memory, and graph databases.
Professional Skill 60 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 11 :** Explore the technicalities like edge devices, gateways, open-source cloud platforms and Wi-Fi module for establishing connectivity between IIoT devices and open-source cloud platforms.	134. Establish bidirectional communication between a GSM module and a microcontroller, enabling data exchange over the cellular network. 135. Design a system to control a relay using a microcontroller through AT commands for cellular devices. 136. Develop a system where cellular devices process and receive sensor data from a microcontroller using AT commands. 137. Use AT commands to provide SMS function and calling function to control LED. 138. Interface devices and sensors to Wi-Fi module to control servo motor. 139. Interface microcontroller to Ethernet port and sending DHT11 sensor data to cloud.	• Understanding the concept of gateways, edge devices. • Introduction to opensource cloud platforms and understand the process of exchanging data. • Concept of High-Power Consumption, High Range, High Bandwidth. • Concept of Low Power Consumption, Low Range, High Bandwidth. • Concept of Low Power Consumption, High Range, Low Bandwidth. • Understanding Cellular connectivity to hardware and cloud. • Understanding Wi-Fi Connectivity to hardware and cloud. • Understanding Ethernet Connectivity to hardware and cloud. • Understanding data collection, storage, and data management
		140. Integrate External Boards into Arduino IDE for Expanded Development Capabilities. 141. Install Wi-Fi Drivers (CH340/CH341/CP2102) for USB to Serial Communication. 142. Verify COM Port on Device Manager for Serial Communication Devices also trouble shoot if com port not detected.	• Adding Wi-Fi module libraries in Arduino IDE. • Understanding ESP8266 Wi-Fi module structure and basic commands. • Connecting to ESP8266 to Wi-Fi router using programming. • Interfacing sensor to ESP8266 Wi-Fi module. • Posting sensor(s) data to web server or cloud.

		143. Integrate external Library Files for Wi-Fi Connectivity in Arduino IDE. 144. Configure the Wi-Fi Board in AP Mode (Access Point) to Control LED. 145. Set up the ESP8266 Wi-Fi Board in Wi-Fi Mode to Control a Relay. 146. Interface Multiple Sensors with ESP8266 and Sending Data to the Cloud. 147. Receive data from the Cloud, processing it, and Sending the Processed Data to Output Pins of the Microcontroller for Actuator Control.	
Professional Skill 60 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 12 :** Demonstrate basics of python programming for IIoT applications.	148. Demonstration of open-source Python software. 149. Explore and Perform to Python basic Code. 150. Write a program to print text in python. 151. Write a program to store a variable and the print variable on screen. 152. Write a program using different data types in python. 153. Write python program using operators and control statement 154. Write program using for loop in python. 155. Write program using do while loop. 156. Write app program using while loop in python 157. Write programs with different types of functions in python. 158. Explore file handling options. 159. Work on modules and	• Introduction to python. • Basics of python. • Understanding Python syntax and data types. • Introduction to Control structures and flow. • Understand Exceptional handling and error management. • Learn File handling and I/O operations. • Learn software testing and debugging.

		libraries related to IoT. 160. Manage error handling and debugging.	
Professional Skill 85 Hrs. Professional Knowledge 20 Hrs.	**L.O. - 13 :** Program Raspberry Pi using Python editor and interface with peripherals for IIoT applications.	161. Configure remote Connectivity for Raspberry Pi - Enabling Access to Raspberry Pi from Anywhere. 162. Install editors and other open-source Software on Raspberry Pi – to Enhancing Raspberry Pi Development Environment. 163. Flash Four LEDs Using Raspberry Pi. 164. Control Led Brightness using Raspberry pi. 165. Interface IR Sensors with Raspberry Pi for Day-Night Detection and Control Bulb. 166. Interface PIR sensors with Raspberry Pi for motion detection and controlling devices. 167. Interface LDR sensors with Raspberry Pi to control a relay. 168. Interface ultrasonic sensors with Raspberry Pi to measure distance. 169. Interface motor with Raspberry Pi to change speed and direction. 170. Interface LCD and sensors with Raspberry Pi to show sensor data on LCD. 171. Interface Keypad with Raspberry Pi to making calculator. 172. Interface sensors viz. DHT11 sensors with Raspberry Pi to show temperature and humidity data. 173. Read sensors viz. DHT11 sensor and process data	• Understanding RPI Processor PIN configuration, memory, graphics, Ethernet, and USB ports. • Understand interfacing sensors to Raspberry Pi. • Understanding basic commands. • Understand programming basics and logic building. • Introduction to sending data from sensors over the internet.

		from sensor and upload data to open-source cloud. 174. Design Smart GPS Tracker using Raspberry Pi - Track and visualize real-time location on a map. 175. Design and develop Garbage Level Indicator - Real-time bio waste management. 176. Temperature Based Fan Control and Monitoring with Raspberry Pi. 177. Design and Develop an Automated Plant Watering System using Soil Moisture and Pump. 178. Raspberry Pi-based Traffic Light Simulator - Simulates real traffic lights using Python and GPIO	
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 14 :** Develop and deploy mobile and Web application for IIoT using open-source platforms.	179. Create an account on open-source platforms for mobile app viz. Android app or website app. 180. Practical using open-source platform/no code platform to create Web/mobile viz. Android interface without coding and explore visual programming and build own mobile applications. 181. Develop a basic Android app using an open-source platform with two screens, interactive elements, and screen navigation. 182. Create a simple app using open-source/block coding platform with a button and a text display. When the button is clicked, update the text display with a custom message. 183. Use open-source/block program platform to create	• Understanding basic components to design user interface. • Understanding and how to use palette, viewer, components property. • Design and develop logic and flow for android applications. • Understanding backend of application and block coding. • Build and test the android application.

		an interactive mobile interface by using media elements and mobile sensors (accelerometer, gyroscope, NFC) for dynamic functionality. 184. Develop android app with block coding to establish Bluetooth connectivity. Control a servo motor through the app using Bluetooth protocols. 185. Build IoT based appliances/devices to monitoring and control home appliances like lights and check their status from the app.	
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 15 :** Program and interface devices to build various IIoT applications.	186. Setup open-source / cloud based no code platform. 187. Build web based interface viz. android for IIoT applications. 188. Build an IIoT application for pollution monitoring system. 189. Build an IIoT application for fire safety. 190. Build an IIoT applications for car. 191. Troubleshoot an IIoT application as per practicals mentioned above.	• Understand how to interface devices. • Understanding and implementing voltage, water-level, air-quality, fire, vibration, temperature, current, IR, RFID, LDR etc. • Interfacing and measuring values with help of required sensors tools and serial monitors. • Ensure data is loaded to the cloud or any other virtual database and test it using tools like postman or dedicated user interface. • Ensure the output devices interface is working for any changes provided by cloud or remote access.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 16 :** Explore security and privacy challenges associated with IIoT systems.	192. Register device on the cloud using security token. 193. Write a simple program to implement HTTPS based web sockets to control a device / sensor.	• Introduction to basic security protocols viz. tokens in terms of IIoT. • Machine to Machine communication and Internet of things.

		194. Explore the Use of API Keys for Enhanced Security in IIoT. 195. Evaluate Security and Data Transfer for MQTT Protocol using any Tool viz. Postman.	• Cloud services -- SaaS, PaaS, IaaS. • Interpret different IoT types of attacks. Security: Recognize IoT security and vulnerability threats. • Preventive measures for attacks and security. • Understanding device management and firmware update.
In-plant training/ Project work **Broad area:** a) Development of weather monitoring system. b) Water level monitoring and control system. c) Home appliances controlled by using sensors and many more projects.			

SYLLABUS FOR INDUSTRIAL INTERNET OF THINGS (IIOT) TECHNICIAN TRADE			
SECOND YEAR			
Duration	**Reference Learning outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 90 Hrs. Professional Knowledge 30 Hrs.	**L.O. - 17 :** Explore ML, python module like pandas, NumPy, etc.	196. Write a Python program that creates a NumPy array of integers from 1 to 10 and then calculates the sum of all the elements in the array. 197. Create a NumPy array of shape (3, 4) filled with random floating-point numbers between 0 and 1. Write a program to find the mean value of each row in the array. 198. Given two NumPy arrays, array1 and array2, write a program to find the element-wise product of these two arrays. 199. Create a NumPy array of shape (5, 5) filled with random integers between 0 and 9. Write a program to find the maximum value in the array. 200. Imagine you are working on an IIoT project, and you have sensor data from a manufacturing plant stored in a CSV file named "sensor_data.csv." The data includes timestamps, sensor IDs, and sensor readings. Write a Python program using Pandas that reads this dataset, filters the data to select sensor readings with values above a certain threshold (e.g., 50), and saves the filtered data to a	• Introduction to NumPy, NumPy Array, Creating NumPy Array, Array Attributes, Array Methods, Array Indexing, Slicing Arrays. • Introduction to Pandas, Pandas Series, Creating Pandas Series, Accessing Series Elements, filtering a Series, Arithmetic Operations, Series Ranking and Sorting, Checking Null Values.

		new CSV file.	
Professional Skill 90 Hrs. Professional Knowledge 30 Hrs.	**L.O. - 18 :** Build impactful data visualizations viz. Matplotlib in Python.	201. Write a Python program to create a line chart, where the x-axis represents the days, and the y-axis represents the temperature. Days: 'Mon', 'Tue', 'Wed', 'Thu', 'Fri', 'Sat', 'Sun' Temperature: 22, 24, 26, 28, 25, 23, 20 respectively. 202. Create two NumPy arrays, X and Y, with random values. Write a program to generate a scatter plot for these values. Customize the plot with different colors, markers, and a legend. 203. Generate a bar chart representing the sales data for different products. Use the following data: Products: A, B, C, D, E Sales: 120, 200, 150, 180, 250 respectively. 204. Generate a pie chart representing the distribution of expenses in a budget using the following data: Categories: Housing, Food, Transportation, Entertainment, Others. Expenses: 30%, 20%, 15%, 10%, 25% respectively.	• Definition and importance of data visualization. • Introduction to Matplotlib library. • History and development. • Customizing axes labels and titles. • Changing plot styles and themes. • Visualizations using Matplotlib, Plot Styles & Settings, Line Plot, Multiline Plot, Matplotlib Subplots, Histogram, Boxplot, Pie Chart, Scatter Plot.

Professional Skill 90 Hrs. Professional Knowledge 30 Hrs.	**L.O. - 19 :** Demonstrate use of machine learning in IIoT.	205. Explore time series dataset for equipment maintenance for IIoT applications. 206. Explore a dataset of equipment performance data to detect abnormal machine behavior. 207. Case Study 1- Imagine you are handling data from a fleet of delivery trucks. The dataset includes the total distance covered by each truck (in kilometers) and the corresponding fuel consumption (in liters). Your task is to create a simple linear regression model to predict fuel consumption based on the distance traveled 208. Case Study 2 - Consider a scenario where you have a dataset that represents the operating hours of an industrial machine (in hours) and the corresponding downtime duration (in minutes). The goal is to build a simple linear regression model to predict downtime based on the machine's operating hours. 209. You are working on an IIoT project that involves analyzing sensor data from a manufacturing plant. You have a CSV file named "sensor_data.csv" with two columns: "Sensor Reading" (X) and "Performance" (Y). Your goal is to perform linear regression on this data to model the relationship between sensor readings and performance metrics.	• Introduction to machine learning and regression • Mathematical foundations of regression. • Definition and purpose of regression analysis. • Understanding different types of regression. • Distinction between linear and non-linear regression. • Concept of dependent and independent variables. • Formulation of the simple linear regression model. • Calculating and interpreting the regression line.

		210. Interface sensor viz. DHT11 sensor with a Raspberry Pi, store the sensor data in a CSV file, and perform linear regression on the temperature readings. calculate and display accurate metrics for the regression models and predict the values.	
Professional Skill 60 Hrs. Professional Knowledge 30 Hrs.	**L.O. - 20 :** Demonstrate different types of IIoT Data Analytics.	211. Write a Python program using Pandas for descriptive analytics on the 'weather_data.csv' dataset to display key statistics, execute the program, document code concisely, and interpret findings from analytics results. 212. Develop a Python program for diagnostic analytics on the 'weather_data.csv' dataset using Pandas for correlation analysis to generate a matrix, highlighting relationships between weather variables. Execute the program, document the code, and analyze the matrix to identify and explain significant correlations. 213. Create a Python program for predictive analytics on the 'weather_data.csv' dataset. Use scikit-learn for machine learning, predicting rain probability based on weather factors. Train, test, and evaluate a classification model, outputting accuracy, precision, recall, and score. Execute the program, document the code, and	• Understanding data analytics and its applications. • Role of data analytics in industrial settings. • Definition and types of data analytics. • Different Types of IIoT Data Analytics- Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics. • Data cleaning and handling missing values. • Feature scaling and normalization.

		interpret the predictive analytics results, emphasizing the model's effectiveness in rain prediction. 214. Create a Python program for prescriptive analytics on 'weather_data.csv.' Generate recommendations based on predicted rain probabilities. A function, weather recommendations, provides real-time suggestions for actions like turning on an agriculture pump.	
Professional Skill 60 Hrs. Professional Knowledge 30 Hrs.	**L.O. - 21 :** Implement ML, CV (computer vision) and data analytics by using hardware.	215. Explore a Python program on a Raspberry Pi using the camera module to capture images and classify them using a pre-trained open-source model, showcasing the integration of hardware, computer vision, and machine learning for real-time image recognition. 216. Explore a plant detection system utilizing a Raspberry Pi and camera module, demonstrating the integration of hardware and computer vision to identify and classify various plant species in real-time. 217. Develop an object detection system using a Raspberry Pi and its camera module to demonstrate ability to implement computer vision techniques for real-time object detection on the Raspberry Pi platform using no code platform/block programming.	• Understanding fundamentals of Computer Vision, ML, and data analytics. • Basics of image processing and computer vision. • Applications of computer vision in IoT and embedded systems. • Understanding how to install and configure OpenCV on Raspberry Pi. • Image processing techniques and feature extraction.

Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 22 :** Execute ML, AI, and data analytic python programs on Raspberry Pi/IoT Gateway and monitor through Web/ mobile application.	218. Build an Image classifier App by using an open-source image classifier. 219. Build plant disease detection mobile application using an open-source module. 220. Build object classification mobile application using open-source algorithm/programs.	• Definition and importance of image classification. • Applications in various domains (e.g., healthcare, autonomous vehicles, agriculture) • Basics of Digital Image Processing and pixel representation. • Understanding open-source image classification modules.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 23 :** Demonstrate programmable logic control, its application, selection criteria and types.	221. Demonstrate programmable logic device and its application in industries. 222. Identify and make a list of communication ports and protocols used in PLC. 223. Demonstration of all input output devices like sensor and motors and their specifications. (7hrs.) 224. Demonstrate and draw connection of input output (IO) module of PLC with IO devices. 225. Demonstrate the sink and source type.	• Introduction to industrial automation. • Block diagram of PLC. • Working principle of PLC. • Briefing about types and manufacturers of PLC. • Understand the input and output devices with examples. • Understanding the selection criteria. • Introduction to scan cycle, scan time. • Understand the difference between rack and rail platforms. • Understanding the role of programmable memory to store the instructions. • Introduction to power supply used in PLC. (14hrs.)

Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 24 :** Demonstrate handling of open-source PLC programming software and explain addressing input / output devices.	226. Demonstrate how to download and install open-source PLC programming software. 227. Demonstration to handle the opening and closing of open-source PLC software. 228. Demonstrate of basic commands used in PLC software. 229. Demonstration of toolbar and explore option to drag and drop a particular item. 230. Demonstrate addressing the input output in PLC software. 231. Create a program to understand basic NO, NC operation. 232. Upload the PLC program. 233. Perform operation using memory bit. 234. Explore and test communication method used to connect PLC.	• Introduction to PLC software. • Understanding different PLC supported languages. • Familiarization with ladder diagram. • Understand addressing syntax. • Understand different protocols used in industry. • Understanding different errors during and after compilation. • Understand concept of PLC password protection. • Understand how to protect PLC program & other data. • Understand the industrial necessity of protecting PLC programming.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 25 :** Write simple PLC programs using ladder diagram to understand basic logic.	235. Develop logic to perform basic operations using basic commands. 236. Compile the PLC ladder diagram in software and see result. 237. Download the ladder diagram program in simulation PLC memory and check result. 238. Create ladder diagrams for all logic gates and compile and check result. 239. Create ladder diagrams for small applications with basic instruction and check the result as per ladder logic. 240. Test online and offline editing the PLC Program. (2 hrs)	• Understanding Ladder Logic is also known as “relay logic”. • Identify and define XIC and XIO output instructions. • Understanding logic gates. • Learn to develop basic programing examples using ladder diagram. • Understanding the types of Input output module like DC input module. AC input module. AC/DC output module. • Understand the option for Uploading downloading and editing

			the program.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 26 :** Explore ladder programming examples on Timers, Counters, and comparators.	241. Build a PLC simulation program using a timer to control the runtime of a pump, ensuring it runs for a specific duration before automatically shutting off. (03 hrs.) 242. Control the lighting in a room with a time-delayed switch-off function using a timer. (02 hrs.) 243. Simulate a traffic light sequence using timers to control the duration of each light phase. (03 hrs.) 244. Build a ladder program using timers to control the timing of different stages in a batch process, such as mixing, heating, and cooling. (02 hrs.) 245. Set a timer to create regular pulses, imitating a pulse signal from various tasks. (02 hrs.) 246. Create a Ladder diagram that includes a timer to introduce a delay before starting a motor, avoiding simultaneous activation with other components. (03 hrs.) 247. Make a PLC program that imitates a car wiper's intermittent movement by using timers to manage the breaks between wipes. (02 hrs.) 248. Build ladder diagram using counter to keep track of the number of parts passing on a conveyor belt. (02 hrs.) 249. Develop a PLC program by implementing a counter to control the filling of a set	• Study the parameters used by timer, counter, and comparator in one program. • Understand batch processing in industries. • Explain the applications of comparators in decision-making. • Understand logic behind combining timers, counters, and comparators for complex control sequences.

		number of bottles on a production line. (03 hrs.) 250. Use a counter to keep track of the number of people entering or exiting a building. (02 hrs.) 251. Develop a program to oversee the manufacturing of a specific quantity of items in a production cycle using a counter. (03 hrs.) 252. Design a program for a car parking area. (03 hrs.)	
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 27 :** Interface open PLC with Arduino and explain with examples.	253. Demonstrate open PLC software and Arduino hardware. 254. Demonstrate input outputs addressing concept. 255. Build programs in open PLC using ladder diagram. 256. Connect a digital input and output from the Arduino to the open PLC software. 257. Connect an analog input and output from the open PLC software to the Arduino. 258. Combine digital input and output. For example, use open PLC software input to trigger an Arduino output. 259. Explore Upload program options. 260. Implement Modbus communication protocol between the PLC and Arduino for data exchange. 261. Connect a temperature sensor to the Arduino. 262. Use the open PLC software to read the temperature data from the Arduino. 263. Connect a stepper motor to the Arduino and program using ladder diagram. 264. Use the open PLC software	• Provide an overview of PLCs and Arduino Nano, highlighting their respective applications. • Study protocols compatibility with both PLCs and Arduino Nano, such as Modbus, MQTT, or custom serial communication, and how they facilitate data exchange. • Explore the programming standards commonly used in open PLCs, emphasizing the need for compatibility. • Discuss the configuration of digital and analog I/O points on the open PLC, explaining how these configurations align with the capabilities of the Arduino Nano. • Explain the theoretical principles of mapping data between the PLC and Arduino Nano, covering addressing schemes and data types.

		to control the movement of the stepper motor. 265. Connect an ultrasonic sensor to the Arduino and program using ladder diagram.	
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 28 :** Interface open PLC with raspberry pi and explain with examples.	266. Demonstrate raspberry pi hardware and open PLC software. 267. Demonstrate input outputs addressing concept. 268. Build programs in open PLC using ladder diagram. 269. Configure a digital input and output from the open PLC to the Raspberry Pi. 270. Explore Upload program options. 271. Configure open PLC runtime. 272. Control the digital output state using the Raspberry Pi. 273. Interface an analog input from the open PLC to the Raspberry Pi. 274. Connect and control analog output from the open PLC to the Raspberry Pi. 275. Implement Modbus communication and exchange data between the open PLC and Raspberry Pi.	• Give an outline of PLCs and raspberry pi to understand the learning outcome. • Examine communication protocols compatible with both, such as Modbus, MQTT, or custom serial communication, and how they facilitate data exchange. • Converse the shape of digital and analog I/O points on the open PLC, rationalizing the interfacing with raspberry pi. • Study mapping open PLC data to raspberry pi.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 29 :** Demonstrate and configure HMI (using open-source software) and explore programming for designing applications.	276. Demonstrate the use of HMI in industries. 277. Install open-source HMI software 278. Demonstration of open-source HMI programming software. 279. Demonstrate communication protocol used for HMI and PLC communication. (05 hrs.) 280. Create HMI Application in	• Introduction to HMI. • Understanding the role of HMI in industries. • Introduction of HMI software. • Introduction to protocols that are used to connect and configure HMI. • Understanding the interfacing of PLC and HMI. • Defining tags used in HMI.

		open-source HMI design Software. 281. Make programs to understand different features of HMI. 282. Upload and download the Program in HMI simulation.	• Understanding programming. • Understand HMI program protection.
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 30 :** Familiarize with the Significance of Industry 4.0	283. Familiarize with the concept of Digital Twin 284. Familiarize with the concept SMART FACTORY 285. Familiarize with the concept ROBOTICS 286. Familiarize with the concept 3D PRINTING 287. Familiarize with the concept MES 288. Familiarize with the concept EQUIPMENT STATUS TRACKING 289. Familiarize with the concept WORK IN PROGRESS TRACKING(WIP) 290. Familiarize with the concept STATISTICAL PROCESS CONTROL	• IIoT ARCHITECTURE • IIoT CLOUD COMPUTING • DIGITAL TRANSFORMATION OF FACTORIES • MES (Manufacturing Execution System) OVERVIEW • SPC (Statistical Process Control)
Professional Skill 45 Hrs. Professional Knowledge 15 Hrs.	**L.O. - 31 :** Develop solutions for interfacing programs with cloud platforms for IIoT applications.	291. Connect sensors or actuators to IoT Gateway. 292. Establish communication to send data from the IoT Gateway to the open-source cloud. 293. Configure and register multiple IoT Gateway to send data to the open-source cloud. 294. Set up a cloud-based simple dashboard using open-source platforms. 295. Configure controller to stream real-time data to the cloud dashboard. 296. Implement cloud-based	• Introduction to the Industrial Internet of Things (IIoT) and its key characteristics. • Introduction to communication protocols used in industrial environments. • Explore basic features of open-source cloud platforms and learn to use them for IIoT application. • Introduction to protocols for connecting with the internet. • Understanding mapping inputs and outputs on

		basic communication protocols (MQTT, HTTP). (05 hrs.) 297. Configure to send and receive data to an open-source cloud database. 298. Monitor ambient environmental data using opensource cloud platform. 299. Demonstrate operation on analog data to open-source cloud platform.	multiple platforms. • Study methods of interfacing controllers with open-source cloud. • Understand how data is sent and received from cloud platforms.
In-plant training/ Project work Broad area: a) Predictive maintenance in industries using ML and IIoT. b) Remote monitoring and control of industrial processes using PLCs, SCADA and IIoT. c) Wate/Wastewater management using PLC, SCADA and IIoT Visit and in plant training to industrial automation industry.			

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs.+ 60 Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in / www.dgt.gov.in

List of Tools & Equipment			
INDUSTRIAL INTERNET OF THINGS (IIoT) TECHNICIAN (For batch of 20 Candidates)			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. GENERAL MACHINERY / SOFTWARE INSTALLATIONS			
1.	UPS (Common to other trades)	3 KVA With Battery & Trolley	1 No.
2.	Industrial Workstation (Common to other trades)	32 GB RAM, NVIDIA Quadro 4GB, Intel XeonW-2123 3.6 4C, 1TB HDD, USB Keyboard & USB Optical Mouse	20 Nos.
3.	Monitor (Common to other trades)	IPS Display, Narrow Bezel	20 Nos.
4.	Server with rack (Common to other trades)	Intel Xeon Silver 4114 2.2G, 10C/20T, 9.6GT/s, 14M Cache, Turbo, HT (85W) DDR4-2400, 600GB x 5nos. 10K RPM SAS, 12Gbps 512n 2.5in Hot plug Hard Drive	1 No.
List of Equipment's / Components			
5.	IoT Gateway supporting all communication protocols , sensors (analog & Digital) and actuators , Can be connected to the cloud with Wi Fi Manager	--	10 Nos.
6.	Cloud based prototype working model of smart factory with IoT (May be locally built or bought)		1 No.
7.	Cloud based prototype working model of predictive maintenance with IoT (May be locally built or bought)		1 No.
8.	Servo Motor	--	10 Nos.
9.	IoT Based integrated PLC platform with HMI		1 No.
10.	DC Motor	--	10 Nos.
11.	Multi-Channel Relay	--	10 Nos.
12.	Battery	--	10 Nos.
13.	Controller- Arduino/IoT Gateway	--	10 Nos.
14.	Raspberry Pi/IoT Gateway	--	10 Nos.
15.	ESP Module	--	10 Nos.

16.	Arduino / Integrated Development Environment	--	10 Nos.
17.	Wi-Fi & Bluetooth Module	--	10 Nos.
18.	Internet Button	--	10 Nos.
19.	OLED	--	10 Nos.
20.	LCD	--	10 Nos.
21.	Switch	--	10 Nos.
22.	Buzzer	--	10 Nos.
23.	LED Bulbs + holder	--	10 Nos.
24.	DC / AC fans	--	10 Nos.
25.	Water pump 12v	--	10 Nos.
26.	Solenoid valve	--	10 Nos.
27.	12V 2A adaptor	--	10 Nos.
28.	TFT HMI	--	10 Nos.
29.	Max 7219 8x8 Dot matrix Display	--	10 Nos.
30.	GPS tracker	--	10 Nos.
31.	GSM Module	--	10 Nos.
32.	Digital Meters	--	10 Nos.
Software			
33.	cloud services platform	Open source or Cloud based Platform	20 Nos.
34.	IoT Circuit Designing Software	Open source or Cloud based Platform	20 Nos.
35.	IoT Block Programming Software	Open source or Cloud based Platform	20 Nos.
36.	IoT Mobile Interface Software	Open source or Cloud based Platform	20 Nos.
37.	Python IDE	Open source or Cloud based Platform	20 Nos.
38.	Arduino IDE	Open source or Cloud based Platform	20 Nos.
39.	PLC Simulation Programming	Open source or Cloud based Platform	20 Nos.
40.	Cloud Based Database	Open source or Cloud based Platform	20 Nos.
Sensors			
41.	Sound sensor	--	10 Nos.
42.	Touch sensor	--	10 Nos.
43.	Gas sensor	--	10 Nos.
44.	Vibration Sensor	--	10 Nos.
45.	Joystick potentiometer sensor	--	10 Nos.
46.	Light sensor	--	10 Nos.

47.	Magnetic switch	--	10 Nos.
48.	Moisture sensor	--	10 Nos.
49.	PIR motion sensor	--	10 Nos.
50.	Temperature sensor	--	10 Nos.
51.	Humidity sensor	--	10 Nos.
52.	Infrared sensor	--	10 Nos.
53.	3 Axis Digital accelerometer & shield for Arduino	--	10 Nos.
54.	Turbidity sensor	--	10 Nos.
55.	PH sensor board	--	10 Nos.
56.	Heartbeat sensor	--	10 Nos.
57.	Water flow sensor	--	10 Nos.
58.	Water level sensor	--	10 Nos.
59.	Current sensor	--	10 Nos.
60.	Ultrasonic	--	10 Nos.
61.	Rain Drop	--	10 Nos.
62.	Flame	--	10 Nos.
63.	Hall Effect Sensor	--	10 Nos.
64.	Camera Module	--	10 Nos.
65.	Fingerprint Sensor	--	10 Nos.
Consumables			
66.	Soldering Metal	--	10 Nos.
67.	Resistor Pack	--	10 Nos.
68.	Capacitor Pack	--	10 Nos.
69.	LED pack	--	10 Nos.
70.	Screwdriver Set	--	10 Nos.
71.	Stripper 150B	--	10 Nos.
72.	Soldering Gun	--	10 Nos.
73.	Insulation Tape	--	10 Nos.
74.	Printed Circuit board	--	10 Nos.
75.	Multistrand and single strand Wires	--	10 Nos.
76.	Jumper Wires with Header-65	--	10 Nos.
77.	Banana pins packet of 10	--	10 Nos.
78.	Glue Gun	--	10 Nos.
79.	Glue Stick	--	10 Nos.

ANNEXURE-II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in 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 contributed/ participated for finalizing the course curriculum of Industrial Internet of Things (IIoT) Trade held on 13.03.2024 at TATA Technologies , Pune.			
S. No.	**Name & Designation Sh./Mr./Ms**	**Organization**	**Remarks**
1.	G. C. Saha, Joint Director	CSTARI Kolkata	Chairman
2.	Dr. Ishtiaq Khan	TATA Technologies Ltd., Pune	Member
3.	N Prem Kumar	Govt. ITI, Tindivanam	Member
4.	C. R. Kanimozhi	Govt. ITI, Madurai	Member
5.	Dr. D Vivekanandan	Govt. ITI, Dharmapuri	Member
6.	Anil Dhole	TATA Technologies Ltd.	Member
7.	Mandar Bhale	TATA Technologies Ltd.	Member
8.	Jahir Khatib	TATA Technologies Ltd.	Member
9.	Sandeep Nimsalka	TATA Technologies Ltd.	Member
10.	Sachin B. Pawade	Govt. ITI Pamprichinehwad, Pune	Member
11.	Uday Bhole	Scientech, Indore	Member
12.	M S Desai	Skill Bahn LLP, Thane	Member
13.	Sunil S Chore	Simusoft Technologies, Pune	Member
14.	Zubin Damania	Autofina Robotics	Member
15.	Abhijeet Band	Autofina Edutech, Pune	Member
16.	Rushabh Parekh	-Do-	Member
17.	Swapnil Maske	-Do-	Member
18.	Nitin S Komawar	Grok learning Pvt. Ltd.	Member
19.	Mayur Deshmukh	Skill Bahn LLP, Thane	Member

20.	Daniel D'Souza	TIF Labs	Member
21.	Sheilesh Temurnikar	Ace Infobehn Pvt. Ltd.	Member
22.	Prashant Handigund	TATA Technologies Ltd.	Member
23.	Satish Karade	Govt. ITI Phaltan, Satara	Member
24.	Meera Karad	Govt. ITI Phaltan, Satara	Member
25.	Satyendra Pawar	Scientech, Indore	Member
26.	Budhaditya Biswas	CSTARI, Kolkata	Member
27.	P K Bairagi	CSTARI, Kolkata	Member

ABBREVIATIONS:

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्