Model Curriculum

QP Name: IIOT System Architecture Engineer

QP Code: CSC/Q0409

Version: 1.0

NSQF Level: 5.5

Model Curriculum Version: 3.0

Capital Goods & Strategic Skill Council || 39, 1st Floor, Samyak Tower, Pusa Rd, Block 9A, WEA Karol Bagh, New Delhi – 110001 || email: ceo@cgssc.org

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Training Parameters

Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods, Defence Equipment, Fire Fighting & Safety Equipment
Occupation	Design
Country	India
NSQF Level	5.5
Aligned to NCO/ISCO/ISIC Code	2521.0100
Minimum Educational Qualification and Experience	UG Degree in relevant field + 3 years of relevant experience or 3 Years UG Degree in Science and Technology (B.Sc / BCA) / 4 years BE, B.Tech (Electrical, Electronics, Mechanical, Mechatronics, Instrumentation and Control)* or 10th grade pass+3 years Diploma in relevant field + 4 year of relevant experience or Previous NSQC level 5 + 1.5 years of relevant experience *Subject to being offered as 6 months internship/ project
Pre-Requisite License or Training	NA
Minimum Job Entry Age	24 Years
Last Reviewed On	31st January 2024
Next Review Date	31st January 2027
NSQC Approval Date	31st January 2024
QP Version	1.0
Model Curriculum Creation Date	31st January 2024
Model Curriculum Valid Up to Date	30 January 2027
Model Curriculum Version	1.0
Minimum Duration of the Course	600 Hours

Maximum Duration of the Course	600 Hours

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Integrate advanced technologies like IoT, AI, and data analytics to enhance overall efficiency and productivity.
- Demonstrate expertise in architecting systems that optimize operational efficiency and reduce downtime.
- Monitor and fine-tune automated processes to continuously enhance desired outcomes.
- Tailor IIOT solutions to specific industrial needs, optimizing performance and ensuring seamless integration with existing systems.
- Develop and implement data collection strategies using sensors and devices to gather relevant information.
- Facilitate capacity building programs to ensure the workforce is equipped with the necessary skills to leverage new technologies effectively.
- Act as a technology evangelist, promoting the adoption of emerging technologies within the organization.
- Implement and enforce robust health, safety, and environmental practices within the workplace.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
CSC/N0428 Assist in creating a smart e-Factory **NOS Version- 1.0** **NSQF Level- 5.5**	**20:00**	**40:00**	**0:00**	**00:00**	**60:00**
Module 1: Create a smart e-factory	02:00	00:00	0:00	00:00	02:00
Module 2: Assist to create a smart e-factory	18:00	40:00	0:00	00:00	58:00
CSC/N0429: Perform system analysis and assist in design, develop and maximize productivity of machinery **NOS Version-1.0**	**30:00**	**60:00**	**0:00**	**00:00**	**90:00**

NSQF Level- 5.5					
Module 3: Perform system analysis and assist in design, develop and maximize productivity of machinery	30:00	60:00	0:00	00:00	90:00
CSC/N0430:Execute Process Control automation to achieve improved productivity **NOS Version- 1.0** **NSQF Level- 5.5**	**20:00**	**40:00**	**30:00**	**00:00**	**90:00**
Module 4: Carry out execution of Process control automation to enhance desired results	20:00	40:00	30:00	00:00	90:00
CSC/N0431: Customize Industrial Internet of Things (IIOT) ecosystem for optimized performance **NOS Version- 1.0** **NSQF Level- 5.5**	**20:00**	**40:00**	**30:00**	**00:00**	**90:00**
Module 5: Customize Industrial Internet of Things (IIOT) for Optimize performance	20:00	40:00	30:00	00:00	90:00
CSC/N0432: Collate data through Sensors and devices, and present it in relevant format for data analysis and data management **NOS Version- 1.0** **NSQF Level- 5.5**	**20:00**	**40:00**	**30:00**	**00:00**	**90:00**
Module 6: Collect and Sample data through Sensors and devices, analysis and data management	20:00	40:00	30:00	00:00	90:00
CSC/N0433: Assist to achieve the desired Product Life Cycle Management **NOS Version- 1.0** **NSQF Level- 5.5**	**40:00**	**50:00**	**0:00**	**00:00**	**90:00**

Module 7: Achieve desired Product Life Cycle Management through selectivity Design approach	40:00	50:00	0:00	00:00	90:00
CSC/N0505: Health, Safety and Environment at workplace **NOS Version- 1.0** **NSQF Level- 6**	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**
Module 8: Health, Safety and Environment at workplace	10:00	20:00	00:00	00:00	30:00
DGT/VSQ/N0102 - Employability Skills (60 hours) **NOS Version No. – 1.0** **NSQF Level – 5**	**20:00**	**40:00**	**00:00**	**00:00**	**60:00**
Module 9: Introduction to Employability Skills	20:00	40:00	00:00	00:00	60:00
Total Duration	**180:00**	**330:00**	**90:00**	**00:00**	**600:00**

Module Details

Module 1: Introduction to the role of a IIOT System Architecture Engineer

Bridge Module, Mapped to CSC/N0428 v1.0

Terminal Outcomes:

- Discuss the job role of a IIOT System Architecture Engineer.

Duration: 02:00	**Duration: 0:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the size and scope of the capital good industry and its sub-sectors. • Discuss the role and responsibilities of an IIOT System Architecture Engineer. • Identify various employment opportunities for a IIOT System Architecture Engineer.	
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Assist to create a smart e-factory

Bridge module, Mapped to CSC/N0428 v1.0

Terminal Outcomes:

- Demonstrate Integrating sensors, actuators, and other devices to collect and exchange data in real-time.
- Implement algorithms for predictive maintenance, quality control, and process optimization.
- Describe and apply encryption, authentication, and access control mechanisms.
- Implement edge computing solutions to process data locally, reduce latency, and Integrate cloud-based services for analytics, storage, and management.

Duration: 18:00	**Duration**: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define and explain the key principles of Industry 4.0, including cyber-physical systems, the Internet of Things (IoT), data analytics, and connectivity in the context of smart e-factories. • Discuss cybersecurity standards, policies, and tools used by vendors, ensuring compatibility with the smart factory's security requirements. • Discuss and explain a comprehensive understanding of the steps involved in planning and executing an Industry 4.0 implementation strategy. • Describe the components required for an Industry 4.0 ready factory, considering technologies such as sensors, automation, cloud computing, and advanced analytics. • Discuss the impact of Industry 4.0 on existing manufacturing processes and articulate strategies for seamless integration. • Describe technology options for each system and sub-system in the plan, identifying the already installed legacy systems, with their advantages and downsides. • Discuss Cyber Security Risk Management Plan, together with Data Backup and Recovery, and Business Continuity Plan	• Assess the challenges and risks associated with the adoption of digital disruptive manufacturing technologies and propose mitigation strategies. • Create detailed engineering documentation for the implementation of Industry 4.0, including system architecture, process workflows, and technology specifications. • Participate in collaborative efforts to plan and design manufacturing production processes that leverage Industry 4.0 technologies for increased agility and flexibility. • Demonstrate the ability to execute smart manufacturing plans, adapting to changing market demands and customer needs. • Show how to create collaboratively, a modular partition of whole system as a system-of-systems, and further drill down to sub-systems (to required depth of details) • Engage in one-to-one interactions with different stakeholders, demonstrating effective communication skills and ensuring alignment with pre-defined goals. • Demonstrate the ability to align individual and team efforts with the overarching smart e-factory objectives.

• Define quality goals for the smart factory and propose candidate quality management systems to achieve these goals. • Discuss the use of new-age technologies in process implementation, such as IoT, AI, machine learning, and cloud computing. • Define quality goals for the smart factory and propose candidate quality management systems to achieve these goals. • Explain Define quality goals for the smart factory and propose candidate quality management systems to achieve these goals. • Define data structures to support efficient data handling and processing. • Discuss the need and importance of documentation Review and Iteration. • Discuss methods to assess vendor capacities and ensure viability in the supply chain.	• Generate comprehensive engineering documentation, including system diagrams, technical specifications, and implementation guidelines. • Document and present a comprehensive overview of existing/planned processes, detailing their sequence, inputs, outputs, and dependencies. • Compile a detailed list of existing/planned sensors, devices, actuators, controllers, and related equipment, highlighting their functionalities and roles in process monitoring and control. • Consolidate a comprehensive list of products, sub-assemblies, and components, including production volumes and a roadmap for future developments. • Identify the sub-assemblies and components to be sourced from external vendors, providing a rationale for outsourcing. • Identify and list potential vendor partners, detailing their capabilities, capacities, technologies, and processes. • Develop detailed engineering drawings and specifications for the smart factory system, drilling down to subsystems and individual components. • Create detailed process flow diagrams that visually represent the sequence and interactions of various processes within the smart factory. • Compile a comprehensive list of vendors categorized based on the components they supply. • Prepare a detailed list of applications and software required for various functionalities within the smart factory. • Demonstrate how to Incorporate customer inputs and requirements into the production plan.

	• Derive plans for each vendor and engage in discussions to ensure viability and alignment with organizational objectives. • Show how to document availability of spare parts for critical systems, minimizing downtime and disruptions. • Analyze the significance of incorporating customer inputs and requirements into the production plan.
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
Tools, Equipment and Other Requirements	
Raspberry Pi 4 , Arduino Boards , Sensors, Motors, servos, LEDs, relays , Communication Modules, Edge Computing Device, ndustrial PLCs , IoT Platforms ,Programming Languages , Simulation Software , Data Analytics Tools ,Industrial Automation Software ,Router, switches, access points Breadboards, jumper wires, soldering irons ,Safety glasses, gloves, and other safety equipment	

Module 3: Perform system analysis and assist in design, develop and maximize productivity of machinery

Bridge module, Mapped to NOS CSC/N0429 v1.0

Terminal Outcomes:

- Develop and execute production plans aligned with organizational goals.
- Use approved and licensed applications for planning, scheduling, and monitoring production, including ERP and SCM systems.
- Utilize appropriate tools and methodologies to enhance operational efficiency and reduce waste.
- Implement preventive measures to ensure the optimal functioning of equipment and facilities.
- Implement strategies to optimize production performance through effective utilization of the Tool Room.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the principles of production planning and scheduling. • Explain the basics of project management methodologies. • Elaborate the importance of monitoring production processes for efficiency. • Discuss the core principles and concepts of Agile, Flexible, and Lean manufacturing. • List the tools and methods associated with each manufacturing approach. • Explain the fundamentals of quality management systems (QMS). • Describe the importance of quality control and assurance in production. • Describe the concept of plant health in a manufacturing context. • List the factors affecting plant health. • Elaborate the role of a tool room in production optimization. • Discuss the use of various tools and equipment used in a tool room. • Describe the principles of scheduling and programming in a robotic production environment. • Explain the need to familiarize with the programming languages and tools used for robotic systems. • Describe the importance of timely issue response in production. • Elaborate the roles and responsibilities of stakeholders in issue resolution.	• Develop production plans and schedules based on resource availability and project timelines. • Implement project management tools and techniques for effective coordination. • Show steps to monitor ongoing projects to identify and address potential issues. • Apply Agile methodologies for quick response to changes in production requirements. • Demonstrate the Implementation of Lean manufacturing tools to minimize waste and improve efficiency. • Integrate flexibility into manufacturing processes for adaptability. • Show how to Implement and contribute to the organization's QMS. • Identify and address quality issues in the production process. • Demonstrate how to collaborate with relevant teams to continuously improve quality standards. • Utilize monitoring tools to assess and maintain the health of production plants. • Demonstrate steps to implement corrective measures in response to plant health issues. • Demonstrate ways to collaborate with maintenance teams for proactive plant management.

	• Demonstrate effective utilization of the tool room to optimize production processes. • Perform steps to implement maintenance and calibration procedures for tools. • Demonstrate ways to collaborate with the tool room team to ensure seamless production. • Demonstrate steps to develop and implement optimal schedules for robotic tools. • Show how to program and troubleshoot robotic systems for efficient production. • Practice ways to collaborate with automation teams to enhance production line efficiency. • Demonstrate steps to follow-up on the proposals and provide additional inputs for decision making
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Raspberry Pi 4 , Arduino Boards , Sensors, Motors, servos, LEDs, relays , Communication Modules, Edge Computing Device, ndustrial PLCs , IoT Platforms ,Programming Languages , Simulation Software , Data Analytics Tools ,Industrial Automation Software ,Router, switches, access points Breadboards, jumper wires, soldering irons ,Safety glasses, gloves, and other safety equipment	

Module 4: Carry out execution of Process control automation to enhance desired results

Bridge module,Mapped to CSC/N0430 v1.0

Terminal Outcomes:

- Demonstrate the ability to architect a distributed plant operation and control system that optimizes processes and enhances overall efficiency in the industrial setting.
- Execute the implementation of plant control using Programmable Logic Controllers (PLC), Human-Machine Interface (HMI), SCADA, and other control systems to ensure a seamless and responsive control mechanism.
- Utilize various types of computer-aided machining to optimize production processes, minimize errors, and achieve planned output targets with precision and accuracy.
- Discuss how to integrate HVAC systems, ACCESS control systems, and RFID-based material movement systems into the plant operations, creating a cohesive and interconnected industrial ecosystem.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the components and functions of distributed plant layout systems. • Describe how various elements in the layout contribute to the overall plant operation. • Discuss the development of a conceptual framework for a distributed plant operation and control system. • Explain the benefits and challenges of distributed control in manufacturing. • Explain the principles and advantages of computer-aided machining. • Elaborate the importance of vendor ecosystems in the context of process control automation. • Discuss the need to develop strategies for effective communication and collaboration with vendors. • Explain the importance of establishing protocols for responsive service and support from vendors.	• Show how to conduct a comprehensive analysis of the existing plant layout systems. • Identify areas for improvement and optimization in the current layout. • Show how to develop a detailed plan for the architecture of the distributed plant control system. • Demonstrate steps to implement the planned architecture using PLCs, HMIs, SCADA, and other relevant systems. • Apply computer-aided machining tools to optimize specific manufacturing processes. • Troubleshoot and debug any issues arising during the implementation of computer-aided machining. • Demonstrate proficiency in programming and configuring Programmable Logic Controllers (PLCs). • Carry out designing and creation of Human Machine Interface (HMI) systems for effective plant monitoring. • Implement and configure Supervisory

	Control and Data Acquisition (SCADA) systems. • Utilize computer-aided machining tools to optimize and automate manufacturing processes. • Design integration strategies for HVAC systems to maintain optimal conditions. • Implement access control systems for secure plant operations. • Develop and integrate RFID-based material movement systems for efficient logistics.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Raspberry Pi 4 , Arduino Boards , Sensors, Motors, servos, LEDs, relays , Communication Modules, Edge Computing Device, industrial PLCs , IoT Platforms ,Programming Languages , Simulation Software , Data Analytics Tools ,Industrial Automation Software ,Router, switches, access points Breadboards, jumper wires, soldering irons ,Safety glasses, gloves, and other safety equipment	

Module 5: Customize Industrial Internet of Things (IIOT) for Optimize performance

Bridge module ,Mapped to CSC/N0431 v1.0

Terminal Outcomes:

- Demonstrate skills to articulate and document the comprehensive scope of IIoT implementation for the organization, ensuring alignment with the business objectives and involving input from all relevant stakeholders.
- Discuss the need to establish a robust IIoT architecture for the organization that adheres to industry standards and best practices, providing a scalable and interoperable foundation for future developments.
- Carry out execution of a collaborative design and implementation process, integrating appropriate devices, connections, protocols, services, and applications while ensuring adherence to Cyber Security standards, resulting in a functional IIoT system.
- Conduct thorough verification processes to ensure the correct implementation of the IIoT system, and validate the accuracy of data, processed information, and analysis, guaranteeing the reliability of the IIoT infrastructure.
- Demonstrate the ability to promptly respond to and address stakeholder requests related to production line performance, quality, customization, or scheduling issues, showcasing the effectiveness of the implemented IIoT system.

Duration: 20:00	**Duration: 40:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define the scope of Industrial Internet of Things (IIoT) for an organization. • Discuss the impact of IIoT on various facets of the organization, including operations, logistics, and maintenance. • Explain and apply industry-specific IIoT standards. • Discuss the development of an IIoT architecture that aligns with the organization's goals and requirements. • Discuss how to utilize appropriate devices, connections, protocols, and services for IIoT realization. • Discuss the need and importance of proficiency in implementing IIoT solutions. • Discuss the importance of addressing and mitigating potential cybersecurity risks.	• Develop strategies to respond to stakeholder requests related to production line performance, quality, customization, or scheduling issues. • Implement real-time monitoring and reporting mechanisms. • Propose and implement corrective actions to address identified issues. • Apply the designed IIoT architecture in a real-world industrial setting. • Troubleshoot and resolve issues that may arise during the implementation. • Optimize the IIoT architecture based on feedback and performance metrics. • Use simulation tools to model and test IIoT systems. • Conduct realistic testing scenarios to assess system performance under different conditions. • Implement improvements based on testing outcomes. • Establish processes for continuous improvement of IIoT systems.

	• Gather feedback from end-users and stakeholders to identify areas for enhancement. • Implement iterative updates and improvements to the IIoT architecture. • Maintain comprehensive documentation of the IIoT architecture and implementation processes. • Perform generation of regular reports for stakeholders on the performance and status of IIoT systems. • Demonstrate the use data-driven insights to make informed decisions for future enhancements.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Raspberry Pi 4 , Arduino Boards , Sensors, Motors, servos, LEDs, relays , Communication Modules, Edge Computing Device, ndustrial PLCs , IoT Platforms ,Programming Languages , Simulation Software , Data Analytics Tools ,Industrial Automation Software ,Router, switches, access points Breadboards, jumper wires, soldering irons ,Safety glasses, gloves, and other safety equipment	

Module 6: Collate data through Sensors and devices, and present it in relevant format for data analysis and data management

Bridge module, Mapped to CSC/N0432 v1.0

Terminal Outcomes:

- Demonstrate the skills to identify and document information requirements at key decision-making points within the IIOT industrial system architecture.
- Discuss how to integrate a variety of sensors and devices into the IIOT industrial system, ensuring seamless data collection and sampling.
- Choose and implement appropriate software, considering the unique requirements of IIOT industrial systems.
- Develop and execute comprehensive testing protocols to ensure the correct processing and analysis of data collected from sensors and devices.

Duration: 30:00	Duration: 30:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define the information requirements at different decision-making points within an IIoT industrial system. • Describe key parameters and variables that need to be captured through sensors and devices for effective decision-making. • Discuss the significance of data collection at various stages of the industrial process. • Explain the concepts of big-data processing and its relevance in handling large datasets generated by IIoT sensors. • Describe the challenges and opportunities associated with processing data in real-time for faster decision-making. • Discuss the capabilities and flexibility required in analytics and AI software for effective data analysis. • Discuss how to select suitable software based on the specific needs of the IIoT industrial system. • Explain the integration process of the chosen software with the existing IIoT infrastructure. • Develop protocols for testing and verifying the correctness of data processing and analysis. • Demonstrate proficiency in troubleshooting and rectifying issues related to data processing. • Explore methods to translate analyzed information into actionable insights. • Discuss strategies for incorporating analyzed	• Implement sensor networks and devices for efficient and accurate data collection. • Troubleshoot and address challenges related to sensor calibration and data acquisition. • Apply big-data processing techniques to handle and analyze large datasets generated by IIoT devices. • Implement real-time data analysis to meet the requirements of timely decision-making. • Demonstrate the steps involved in implementing selected software for data analysis. • Configure and integrate analytics and AI software into the IIoT industrial system. • Demonstrate ways to ensure compatibility and seamless communication between different components of the system. • Develop test cases to validate the correctness of data processing and analysis. • Conduct thorough testing to identify and resolve potential issues in the software implementation. • Utilize visualization tools to represent analyzed data in a comprehensible format. • Demonstrate effective communication of insights through graphical representations. • Integrate analyzed information into the decision-making process of the IIoT industrial system. • Evaluate the impact of the implemented data management strategies on response

data into the decision-making process.	time to market demands and supply chain changes. • Create comprehensive documentation detailing the entire data collection, analysis, and decision-making process. • Generate reports outlining the key findings, insights, and recommendations derived from the analyzed data.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Raspberry Pi 4 , Arduino Boards , Sensors, Motors, servos, LEDs, relays , Communication Modules, Edge Computing Device, ndustrial PLCs , IoT Platforms ,Programming Languages , Simulation Software , Data Analytics Tools ,Industrial Automation Software ,Router, switches, access points Breadboards, jumper wires, soldering irons ,Safety glasses, gloves, and other safety equipment	

Module 7: Assist to achieve the desired Product Life Cycle Management

Bridge module,Mapped to CSC/N0433 v1.0

Terminal Outcomes:

- Develop a detailed and comprehensive documentation of the PLM design process, outlining each stage from concept to retirement.
- Demonstrate how Industry 4.0 technologies enhance the efficiency of the PLM process, allowing for quicker design iterations and production.
- Showcase the methods and tools employed to gather input, feedback, and collaboration from external stakeholders, enhancing product acceptance and ensuring timely availability of components.
- Develop a robust system for analyzing and managing the impact of change requests on manufacturing processes and plans.
- Develop training programs and facilitate knowledge transfer sessions to ensure that the organization's workforce is well-equipped to understand, implement, and adapt to the proposed PLM design approach.
- Show how to establish metrics for measuring stakeholder satisfaction throughout the product lifecycle.

Duration: 40:00	**Duration: 50:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define the stages of product life cycle from concept to retirement. • Explain the significance of PLM in achieving efficient product development and management. • Describe Industry 4.0 technologies, including rapid prototyping and additive manufacturing. • Discuss the impact of Industry 4.0 on PLM processes. • Identify and analyze the PLM design process used in organizations. • Evaluate various tools employed in PLM for effective product development. • Explore methods to facilitate customer and vendor participation in the design loop. • Discuss the advantages of connected environments in enhancing collaboration and stakeholder involvement. • Understand the impact of change requests on the manufacturing process and plans. • Propose strategies for effective change management within the PLM framework. • Propose methods, tools, and processes to improve overall product lifecycle efficiency. • Analyze how connected environments contribute to efficiency gains in PLM.	• Demonstrate the use of PLM tools in capturing and managing the design process. • Apply selected PLM tools in a simulated product development scenario. • Integrate Industry 4.0 technologies such as rapid prototyping and additive manufacturing into PLM workflows. • Simulate small volume production scenarios using additive manufacturing processes. • Implement a connected environment that enables real-time collaboration with customers and vendors in the design loop. • Showcase the benefits of customer and vendor participation through practical examples. • Develop a change management plan for handling change requests during different stages of product development. • Simulate the impact of change requests on manufacturing processes and propose adaptive strategies. • Implement proposed methods and processes to improve efficiency in the product lifecycle. • Measure and evaluate the impact of efficiency improvements using key performance indicators. • Engage in a project where students apply

	PLM principles, Industry 4.0 technologies, and efficient processes to manage the entire life cycle of a product. • Present the project outcomes, showcasing how theoretical knowledge was applied in a real-world context.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Raspberry Pi 4 , Arduino Boards , Sensors, Motors, servos, LEDs, relays , Communication Modules, Edge Computing Device, ndustrial PLCs , IoT Platforms ,Programming Languages , Simulation Software , Data Analytics Tools ,Industrial Automation Software ,Router, switches, access points Breadboards, jumper wires, soldering irons ,Safety glasses, gloves, and other safety equipment	

Module 8: Maintain Health, Safety and Environment at workplace

Bridge module,Mapped to CSC/N0505 v1.0

Terminal Outcomes:

- Demonstrate ways to maintain personal health and safety.
- Describe the process of assisting in hazard management.
- Explain how to check the first aid box, firefighting and safety equipment.
- Describe the process of assisting in waste management.
- Explain the importance of following the fire safety guidelines.
- Explain the importance of following the emergency and first-aid procedures.
- Demonstrate the process of carrying out relevant documentation and review

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the recommended practicesto be followed to ensure protection from infections and transmission to others, such as the use of hand sanitizer and face mask. • Explain the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them. • Explain the importance and process of selecting and using the appropriatePPE relevant to the task and work conditions. • Explain the recommended techniques to be followed while lifting and moving heavy objects to avoid injury. • Explain the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, toolsand equipment. • Explain the importance and process of identifying existing and potential hazards at work. • Describe the process of assessing the potential risks and injuries associated with the various hazards. • Explain how to prevent or minimise different types of hazards.	• Demonstrate the use of appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions. • Demonstrate how to handle hazardous materials safely. • Demonstrate the process of testing the firefighting and various safety equipment to ensure they are in usable condition. • Demonstrate the process of recycling and disposing different types of waste appropriately. • Demonstrate how to use the appropriate type of fire extinguisher to extinguish different types of fires safely. • Demonstrate how to administer appropriate first aid to the injured personnel. • Demonstrate the process of performing Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest. • Demonstrate the process of carrying out appropriate documentationnfollowing a health and safety incidentat work, including all the required information.

• Explain how to handle and store hazardous materials safely. • Explain the importance of ensuring the first aid box is updated with the relevant first aid supplies. • Describe the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition. • Explain the criteria for segregating waste into appropriate categories. • Describe the appropriate methods for recycling the recyclable waste. • Describe the process of disposing of the non-recyclable waste safely and the applicable regulations. • Explain the use of different types of fire extinguishers to extinguish different types of fires. • State the recommended practices to be followed for a safe rescue during a fire emergency. • Explain how to request assistancefrom the fire department to extinguish a serious fire. • Explain the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property. • State the common health and safety hazards present in a work environment, associated risks, and how to mitigate them. • State the safe working practices to be followed while working at various hazardous sites and using electrical equipment. • Explain the importance of ensuring easy access to firefighting and safety equipment. Explain the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous chemicals and gases. • Explain various causes of fire in	

different work environments and the recommended precautions to be taken to prevent fire accidents. • Describe different methods of extinguishing fire. • List different materials used for extinguishing fire. • Explain the applicable rescue techniques to be followed during a fire emergency. • Explain the importance of placing safety signs and instructions at strategic locations in a workplace and following them. • Explain different types of first aid treatment to be provided for different types of injuries. • State the potential injuries associated with incorrect manual handling. • Explain how to move an injured person safely. • State various hazards associated with the use of various machinery, tools, implements, equipment and materials. • Explain the importance of ensuring no obstruction and free access to fire exits. • Explain how to free a person from electrocution safely. • Explain how to administer appropriate first aid to an injured person. • Explain how to perform Cardiopulmonary Resuscitation (CPR). • Explain the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation. State the appropriate documentation to be carried out following a health and safety incident at work, and the relevant information to be included.	

• Explain the importance and process of reviewing the health and safety conditions at work regularly or following an incident. • Explain the importance and process of implementing appropriate changesto improve the health and safety conditions at work.	
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
Tools, Equipment and Other Requirements	
Personal Protective Equipment, Cleaning Equipment and Materials, Sanitizer, Soap, Mask	

Module 9: Employability Skills

Mapped to DGT/VSQ/N0102 -Employability Skills (60 hours) v1.0

Terminal Outcomes:

- Discuss the Employability Skills required for jobs in various industries
- Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
- Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan

Duration: *20:00*	**Duration**: *40:00*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the Employability Skills required for jobs in various industries • List different learning and employability related GOI and private portals and their usage • Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen • Discuss the importance of relevant 21st century skills. • Describe the benefits of continuous learning. • Explain the importance of active listening for effective communication • Discuss the significance of working collaboratively with others in a team • Discuss the significance of escalating sexual harassment issues as per POSH act. • List the common components of salary and compute income, expenditure, taxes, investments etc. • Discuss the legal rights, laws, and aids • Describe the role of digital technology in today's life • Discuss the significance of displaying responsible online behaviour while	• Practice different environmentally sustainable practices. • Exhibit 21st century skills like Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life. • Demonstrate to use basic English sentences for everyday conversation in different contexts, in person and over the telephone • Read and interpret text written in basic English • Write a short note/paragraph / letter/e -mail using basic English • Create a career development plan with well-defined short- and long-term goals • Communicate effectively using verbal and nonverbal communication etiquette. • Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD • Outline the importance of selecting the right financial institution, product, and service • Demonstrate how to carry out offline and online financial transactions,

browsing, using various social media platforms, e-mails, etc., safely and securely • Explain the types of entrepreneurship and enterprises • Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan • Describe the 4Ps of Marketing- Product, Price, Place and Promotion and apply them as per requirement • Detail the significance of analyzing different types and needs of customers • Explain the significance of identifying customer needs and responding to them in a professional manner. • Discuss the significance of maintaining hygiene and dressing appropriately • Explain the significance of maintaining hygiene and confidence during an interview • List the steps for searching and registering for apprenticeship opportunities	safely and securely • Operate digital devices and use the associated applications and features, safely and securely • Create sample word documents, excel sheets and presentations using basic features • Utilize virtual collaboration tools to work effectively • Devise a sample business plan, for the selected business opportunity • Create a professional Curriculum Vitae (CV) • Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively • Perform a mock interview
Classroom Aids:	
PPT, Laptop, White Board, Marker, Projector & Screen, Audio-visual, Chart paper, telephone connection, landline phone, and other required stationery.	
Tools, Equipment and Other Requirements	
Computer (PC) with latest configurations – and Internet connection with standard operating system and standard word processor and worksheet software (Licensed) (all software should either be latest version or one/two version below), Scanner cum Printer	

Requirements

Annexure

Trainer

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Degree	Degree in Mechanical/ Electronics/ Mechatronics Engineering	7				knowledge required in the relevant field

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "**IIoT System Architecture Engineer**"mapped to QP: "CSC/Q0409, v1.0". Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer(VET and skills)", mapped to the Qualification Pack: "MEP/Q2601 V3.0". Minimum accepted as per respective SSC guidelines is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Degree	Degree in Mechanical/ Electronics/ Mechatronics Engineering	7		0		Practical skills and knowledge required in the relevant field

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "**IIoT System Architecture Engineer**"mapped to QP: "CSC/Q0409, v1.0". Minimum accepted score is 80%	Recommended that the assessor is certified for the Job Role: "Assessor(VET and skills)", mapped to the Qualification Pack: "MEP/Q2701, v3.0", with a minimum score of 80%.

Assessment Strategy

1. Assessment System Overview:
    - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
    - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
    - The assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records
2. Testing Environment

    To ensure a conducive environment for conducting a test, the trainer will:
    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training.
    - Check the Assessment Start and End time to be 10 a.m. and 5 p.m. respectively
    - Ensure there are 2 Assessors if the batch size is more than 30.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
    - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
    - Check the availability of the Lab Equipment for the particular Job Role.
3. Assessment Quality Assurance levels / Framework:
    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with NOS and PC
    - Question papers are prepared considering that levels 1 to 3 are for the unskilled & semi-skilled individuals, and levels 4 and above are for the skilled, supervisor & higher management
    - The assessor must be ToA certified and the trainer must be ToT Certified
    - The assessment agency must follow the assessment guidelines to conduct the assessment
4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Centre photographs with signboards and scheme-specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
5. Method of verification or validation:

    To verify the details submitted by the training centre, the assessor will undertake:
    - A surprise visit to the assessment location
    - A random audit of the batch
    - A random audit of any candidate
6. Method for assessment documentation, archiving, and access

    To protect the assessment papers and information, the assessor will ensure:
    - Hard copies of the documents are stored

- Soft copies of the documents & photographs of the assessment are uploaded/accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored on the Hard drive

References

Glossary

Term	Description
Declarative knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning	The key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on-site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on-site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do **upon the completion of the training**.
Terminal Outcome	The terminal outcome is a statement of what a learner will know, understand and be able to do **upon the completion of a module.** A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
NOS	National Skills Qualification Committee
NSQF	National Skills Qualification Framework
OJT	On-the-Job Training
OMR	Optical Mark Recognition
PC	Performance Criteria
PwD	Persons with Disabilities
QP	Qualification Pack
SDMS	Skill Development & Management System
SIP	Skill India Portal
SSC	Sector Skill Council
TC	Trainer Certificate
ToA	Training of Assessors
ToT	Training of Trainers
TP	Training Provider