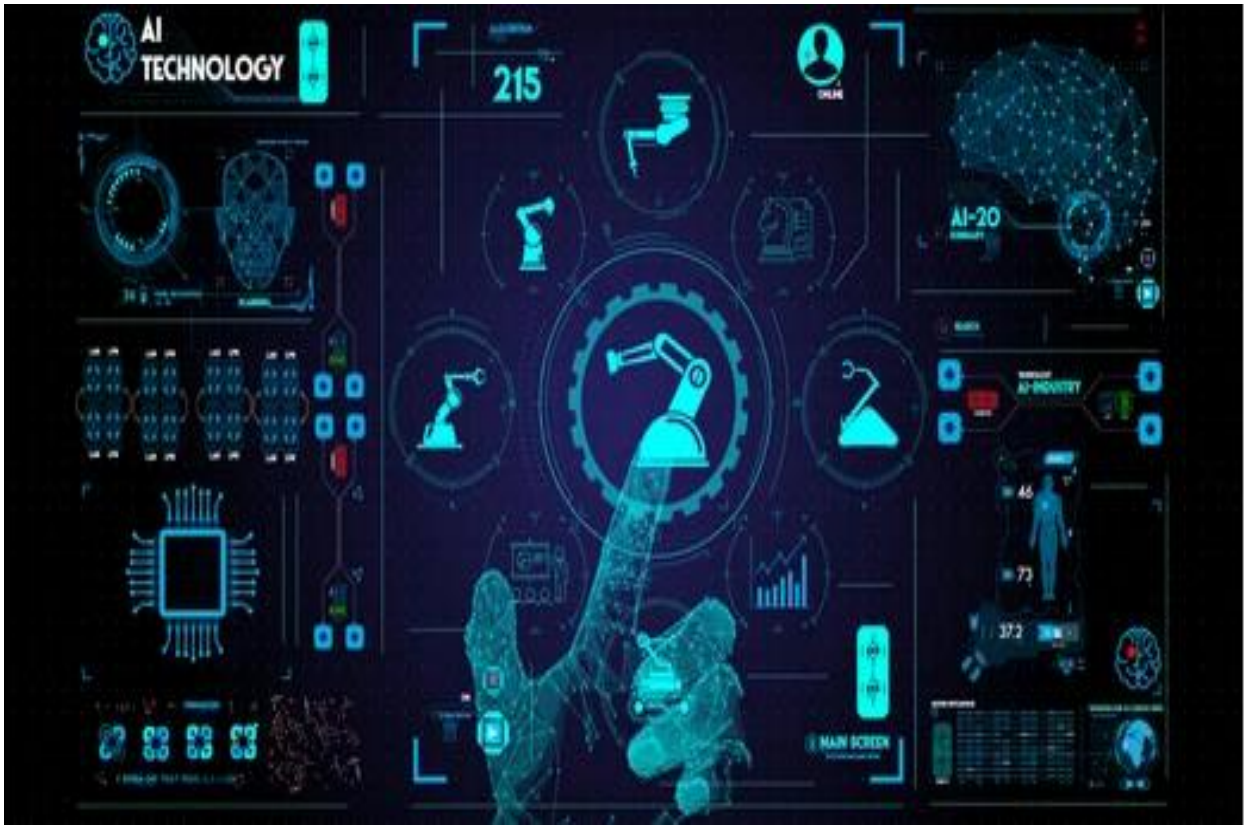

Model Curriculum

QP Name: Automotive Smart Manufacturing Engineer

QP Code: ASC/Q8307

QP Version: 1.0

NSQF Level: 6

Model Curriculum Version: 1.0

Automotive Skills Development Council | 153, Gr Floor, Okhla Industrial Area, Phase – III, Leela Building, New Delhi – 110020

Table of Contents

Training Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Automotive Product Development
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3122.6502
Minimum Educational Qualification and Experience	M.E./M.Tech in the relevant field OR B.E./B.Tech in the relevant field with 1 Year of relevant experience, OR 3 years Diploma (Mechanical/Automobile/Electrical / Electronics) from recognized regulatory body after class 12th with 3 years of relevant experience OR Certificate-NSQF (Automotive Prototype Manufacturing Lead Technician Level 5) with 3 Years of relevant experience
Pre-Requisite License or Training	
Minimum Job Entry Age	22 years
Last Reviewed On	28th July, 2022
Next Review Date	28th July, 2025
NSQC Approval Date	28th July, 2022
QP Version	1.0
Model Curriculum Creation Date	28th July, 2022
Model Curriculum Valid Up to Date	28th July, 2025
Model Curriculum Version	1.0
Minimum Duration of the Course	570 Hours
Maximum Duration of the Course	570 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.

- Perform designing of IIOT devices and systems
- Perform integration of Machines, Robots and Automation system
- Perform remote monitoring, controlling and fetching vital machine data using IIOT edge devices.
- Perform maintenance and troubleshooting of IIOT network and devices.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Use resources optimally to ensure less wastage and maximum conservation.
- Communicate effectively and develop interpersonal skills.

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
Bridge Module					
Module 1: Introduction to the role of an Automotive Smart Manufacturing Engineer	5:00	0:00			5:00
ASC/N9810: Manage work and resources (Manufacturing) NOS Version No. – 1.0 NSQF Level – 5	**20:00**	**40:00**			**60:00**
Module 2: Manage work and resources according to safety and conservation standards	20:00	40:00			60:00
ASC/N9812 – Interact effectively with team, customers and others NOS Version No. 1.0 NSQF Level 5	**20:00**	**35:00**			**55:00**
Module 3: Communicate effectively and efficiently	20:00	35:00			55:00
ASC/N8320– Selection and designing of IIoT sensors, dashboard and automation systems NOS Version No. – 1.0 NSQF Level - 6	**15:00**	**55:00**	**80:00**		**150:00**
Module 4: Selection and designing of IIoT sensors,	15:00	55:00	80:00		150:00

dashboard and automation systems					
ASC/N8321 – Manage integration of IIoT sensors, edge devices and machines with robots and industrial automated systems NOS Version No. –1.0 NSQF Level - 6	**15:00**	**55:00**	**80:00**		**150:00**
Module 5: Manage integration of IIoT sensors, edge devices and machines with robots and industrial automated systems	15:00	55:00	80:00		150:00
ASC/N8322 – Manage remote monitoring, controlling and data acquisition through IIoT sensors and edge devices NOS Version No. –1.0 NSQF Level - 6	**15:00**	**55:00**	**80:00**		**150:00**
Module 6: Manage remote monitoring, controlling and data acquisition through IIoT sensors and edge devices	15:00	55:00	80:00		150:00
Total Duration	**90:00**	**240:00**	**240:00**		**570:00**

Module Details

Module 1: Introduction to the role of an Automotive Smart Manufacturing Engineer

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of an Automotive Smart Manufacturing Engineer.

Duration: *<05:00>*	**Duration**: *<00:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the role and responsibilities of an Automotive Smart Manufacturing Engineer. • Discuss the job opportunities for an Automotive Smart Manufacturing Engineer in the automobile industry. • Explain about Indian automobile manufacturing market. • List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them. • Discuss automation and manufacturing standards and procedures followed in the company.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	

Module 2: Manage work and resources according to safety and conservation standards

Mapped to ASC/N9810, v1.0

Terminal Outcomes:

- Employ appropriate ways to maintain safe and secure working environment
- Apply material and energy conservation practices at the workplace.

Duration: *<20:00>*	**Duration**: *<40:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss organisational procedures for health, safety and security and individual role and responsibilities related to the same. • List the potential workplace related risks, threats and hazards, their causes and preventions. • List personal protective equipment like safety gloves, glasses, shoes and mask used at the workplace. • List various types of fire extinguisher. • Identify various safety boards/ signs placed on the shop floor. • Explain 5S standards, procedures and policies followed at workplace. • Discuss organisational procedures to deal with emergencies and accidents at the workplace and importance of following them. • State the importance of conducting safety drills or training sessions. • Explain the process of filling daily check sheet for reporting to the concerned authorities about improvements done and risks identified. • Discuss how and when to report about potential hazards identified in the workplace and limits of responsibility for dealing with them. • Outline the importance of keeping workplace, equipment, restrooms etc. clean and sanitised. • Explain the importance of following hygiene and sanitation regulations developed by organisation at the workplace. • Discuss the importance of maintaining the availability of running water, hand wash and alcohol-based sanitizers at the	• Apply appropriate ways to implement safety practices to ensure safety of people at the workplace. • Display the correct way of wearing and disposing PPE. • Demonstrate the use of fire extinguisher. • Demonstrate how to provide first aid procedure in case of emergencies. • Demonstrate how to evacuate the workplace in case of an emergency. • Employ various techniques for checking malfunctions in the machines with the support of maintenance team and as per Standard Operating Procedures (SOP). • Demonstrate to arrange tools/ equipment/ fasteners/ spare parts into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions. • Apply appropriate ways to organise safety drills or training sessions for others on the identified risks and safety practices. • Prepare a report about the health, safety and security breaches. • Apply appropriate ways to check that workplace, equipment, restrooms etc. are cleaned and sanitised. • Role play a situation to brief the team about the hygiene and sanitation regulations developed by organisation. • Demonstrate the correct way of washing hands using soap and water and alcohol-based hand rubs. • Apply appropriate methods to support the employees to cope with stress, anxiety etc. • Demonstrate proper waste collection and disposal mechanism depending upon types of waste.

workplace. • Discuss the significance of conforming to basic hygiene practices such as washing hands, using alcohol based hand sanitizers or soap. • Recall ways of reporting advanced hygiene and sanitation issues to the concerned authorities. • Elucidate various stress and anxiety management techniques. • Discuss the significance of greening. • Classify different categories of waste for the purpose of segregation. • Differentiate between recyclable and non-recyclable waste. • Discuss various methods of waste collection and disposal. • List the various materials used at the workplace. • Explain organisational recommended norms for storage of tools, equipment and material. • Discuss the importance of efficient utilisation of material and water. • Explain basics of electricity and prevalent energy efficient devices. • Explain the processes to optimize usage of material and energy/electricity. • Enlist common practices for conserving electricity at workplace.	• Perform the steps involved in storage of tools, equipment and material after completion of work. • Employ appropriate ways to resolve malfunctioning (fumes/ sparks/ emission/ vibration/ noise) and lapse in maintenance of equipment as per requirements. • Perform the steps to prepare a sample material and energy audit reports. • Employ practices for efficient utilization of material and energy/electricity.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Housekeeping material: Cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel, fire extinguisher • Safety gears: Safety shoes, ear plug, goggles, gloves, helmet, first-aid kit	

Module 3: Communicate Effectively and Efficiently

Mapped to ASC/N9812, v1.0

Terminal Outcomes:

- Use effective communication and interpersonal skills.
- Apply sensitivity while interacting with different genders and people with disabilities.

Duration: *<20:00>*	**Duration**: *<35:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of complying with organizational requirements to share information with team members. • Discuss the ways to adjust the communication styles to reflect sensitivity towards gender and persons with disability (PwD). • Explain the importance of respecting personal space of colleagues and customers. • Describe the ways to manage and coordinate with team members for work integration. • State the importance of team goals over individual goals, keeping commitment made to team members, and informing them in case of delays. • Discuss the importance of following the organisation's policies and procedures • Discuss the importance of rectifying errors as per feedback and minimizing mistakes. • Discuss gender-based concepts, issues and legislation as well organization standards, guidelines, rights and duties of PwD. • Discuss the importance of PwD and gender sensitization to ensure that team shows sensitivity towards them. • State the importance of following organizational standards and guidelines related to PwD. • Recall the rights and duties at workplace with respect to PwD. • Outline organisation policies and procedures pertaining to written and verbal communication.	• Employ different means and methods of communication depending upon the requirement to interact with the team members. • Employ appropriate ways to maintain good relationships with team members and superiors. • Apply appropriate techniques to resolve conflicts and manage team members for smooth workflow. • Conduct training sessions to train the team members on proper reporting of completed work and receiving feedback. • Employ suitable ways to escalate problems to superiors as and when required. • Prepare a sample report on the progress and team performance . • Role play a situation on how to offer help to people with disability (PwD) if required at work.
Classroom Aids:	
Whiteboard/blackboard, marker/chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	

Module 4: Selection and designing of IIoT sensors, dashboard and automation systems

Mapped to ASC/N8320, v1.0

Terminal Outcomes:

- Describe the components required for implementing an IoT network.
- Evaluate and comply with various regulatory standards and protocols.

Duration: *<15:00>*	**Duration**: *<55:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the information obtained from mechanical drawings and layout diagram related to project's module design. • List the requirements of the IIoT network, sensors, components, type of materials etc. to form an IoT network infrastructure based on the needs of the IoT solution. • Discuss the selection criteria of appropriate technology, devices, sensors, specific hardwires, components, type of materials, and deployment model as per the requirements of the IoT network for smart manufacturing process. • Describe the characteristics of various deployment models, network topologies, and connection types. • Discuss the selection criteria of core and auxiliary support process as per the requirements of the IoT network for smart manufacturing process. • Describe network topologies, wired and wireless technologies, fiber optics, etc. • Explain functioning of network management dashboards and their applications. • Describe the characteristics of wired/ wireless connectivity protocols for device-device or device-gateway communications (this may include protocols such as NFC, NB-IoT, Bluetooth/BLE, ZigBee, Mesh, and Lora). • Describe the characteristics of connectivity protocols for device-cloud communications (this may include protocols such as 5G, Wi-Fi, GSM, GPRS, and Satellite). • Elaborate ways to evaluate interoperability of network, i.e., the ability of diverse components to work together	• Show how to evaluate the components and connections that form an IoT network infrastructure based on the needs of the IoT solution. • Apply appropriate techniques to prepare design of hardware schematics and PCB dimension for development of IIoT sensors with IO-Links. • Show how to design IO-Link system for switch console as per design requirements. • Prepare a sample electrical wiring schematic diagram for connecting sensors, machines, robots and automation system. • Prepare sample firmware for IIoT sensors IO-links, switch consoles for interfacing with the DATA-Link protocol. • Show how to design network nodes (wired and wireless) to connect IIoT sensors and edge devices. • Demonstrate the application connectivity protocols based on the needs of IoT solutions. • Apply appropriate ways to build an interoperable network that permits seamless communication across diverse components. • Prepare a design of fallback mechanism in case of network outages. • Develop network dashboards to monitor IoT networks. • Demonstrate how to monitor and configure component functionalities across the IoT network. • Demonstrate procedure of tests on the sensors to test their synchronization for data transmission and properly visible on networking dashboard.

regardless of their varying technical specifications. • Discuss various regulatory guidelines to ensure that the IoT network complies with the identified standards such as permitted frequency bands.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
PCs/Laptops, Internet with Wi-Fi (Min2 Mbps Dedicated) Tools and Programming Languages: • Wired/wireless connectivity protocols for device-device or device-gateway communications such as NFC, NB-IoT, Bluetooth/BLE, ZigBee, Mesh and Lora • Wired/wireless connectivity protocols for device-cloud communications such as 5G, Wi-Fi, GSM, GPRS and Satellite • Routing protocols such as RIP, OSPF, EIGRP, BGP and IP services (QoS, NAT etc) and L2/L3 VPNs • IoT Platforms such as Watson IoT, GE Predix, PTC Thingworx, AWS IoT, Azure IoT, Eclipse IoT, DeviceHub, Arduino, Raspberry Pi • • Documentation tools such as Adobe and MS-Word	

Module 5: Manage integration of IIoT sensors, edge devices and machines with robots and industrial automated systems

Mapped to ASC/N8321, v1.0

Terminal Outcomes:

- Perform the steps of preparing for IIOT network development.
- Demonstrate organisational procedure of integrating system by using industrial networking protocols, IIOT Sensors and I/O Link

Duration: *<15:00>*	**Duration**: *<55:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe different layers of network architecture. • Describe functioning of various network devices like routers, network switch, repeaters. • Illustrate design of industrial network between devices based on protocols, topology and device parameters. • Elaborate ways to analyse the installed Machines, automation elements, system and robots into different layers of network architecture like field devices, control devices, network. • Describe types of network protocols, topology and its significance. • Discuss device manufacturer software for network parameter settings and device communication. • Discuss the selection criteria of suitable network protocols like MODBUS,CC-LINK, Profinet, Profibus, OPC UA, MQTT etc. based on control system requirements. • List the steps to be performed for installing network protocols in the system. • Describe network topology like STAR, LINE, RING. • List the steps to be performed for connecting the intelligent devices and system by using suitable network topology like STAR, LINE, RING as per network design document. • Discuss working and integration of different elements using I/O link master to the controller. • Describe data types like machine, process and control data from robot and automation system in the network. • Discuss the need of automation elements	• Employ appropriate ways to design / interpret the network consists of devices, automation system and robots. • Demonstrate Standard operation procedures recommended by manufacturer for using equipment / machinery. • Show how to select the suitable network protocols like MODBUS,CC-LINK, Profinet, Profibus, OPC UA, MQTT etc. based on control system requirements. • Employ appropriate ways to verify the network that consists of devices, automation system and robots. • Demonstrate organisational procedure installing the network protocols and connecting the intelligent devices in the system. • Show how to connect the automation elements like sensors, control devices to I/O link master. • Apply appropriate ways to install the cable between devices in align with signaling parameters. • Employ appropriate ways to establish the communication between automation system, intelligent devices and robots • Show how to turn on the power of automation devices, system in the network and observe their functioning. • Apply appropriate ways to protect the network from unauthorized access or malicious internet and allow only authorized devices to connect to the network. • Employ appropriate ways for conducting trial run of the systems as per the e-plan to align it with existing or new

like sensors, control devices in the system. • Describe signaling parameters like bend radius, signal ground, terminal resistor, cable length etc. and their impact on system functioning. • Describe parameter like baud rate, distance, station ID and station type and how to set them in the system. • Describe ways to provide physical security of the network contains IIOT Edge Devices, IIOT Sensors, Machines, Robots and Automation System. • Explain the organisational specified policies and procedures for conducting trial run of the system/ • List the documents needed to be prepared related to procurement, trial run and modifications done on the system. • Discuss the records and documents needed to be prepared and maintained such as experience under development, TGW /TGR faced during process trials etc. as a reference for future development.	manufacturing process. • Show how to handover the system to production team & train them on it as per SOP.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
PCs/Laptops, Internet with Wi-Fi (Min2 Mbps Dedicated) 18 documents of PPAP, Design records, Design Records, Authorized Engineering Change Documents, Customer Engineering Approval, Design Failure Modes and Effects Analysis (DFMEA), applied in special situations, Process Flow Diagram, Process Failure Modes and Effects Analysis (PFMEA) Control Plan, Part Submission Warrant (PSW), Engineering Change Documents Dimensional Results, PLC Simulator, Hydraulic, Pneumatic, Electronic Control Systems Simulator, Internet of Things study material and IOT communication devices, Manufacturing Execution system, manufacturing operation management system. Hydraulics and pneumatics systems simulator, PLC Simulator with required software, Air Cylinders, valves, connector/tubing simulators, Pick and place robots assembly Electronics sensor like proximity, optical, magnetic sensors.	

Module 6: Manage remote monitoring, controlling and data acquisition through IIoT sensors and edge devices

Mapped to ASC/N8322, v1.0

Terminal Outcomes:

- Perform the steps to monitor the IIOT edge devices.
- Demonstrate organisational procedure of controlling and fetching vital machine data using IIOT edge devices.

Duration: *<15:00>*	**Duration**: *<55:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Recall organizational policies and procedures for sharing data and documenting network designs and fallback mechanisms. • Discuss standard templates and tools available and how to use them. • Describe connectivity protocols for device-cloud communications and wired/wireless connectivity protocols for device-device or device-gateway communications. • Describe network management dashboards and applications. • Describe network topologies, wired and wireless technologies, fiber optics, etc. • Recall internal and external network regulations. • Discuss ways to monitor Life of Subsystems with user defined limits and analyse the Present condition of the machines, Robots and Automation System (cycling, idle, setup, breakdown). • Discuss the information obtained from machine power consumption report and machine spare part life utilization report. • Discuss reasons for machine idleness, machine setup activity, machine breakdown activity. • Elaborate ways to analyse the Real time feed override, consumable request, System alarm etc. • Elaborate ways to analyse the present condition of the machines, Robots and Automation System.	• Show how to conduct on-site surveys on the IIoT network and connected sensors and EDGE devices with machines in automation system. • Apply appropriate ways to check on field device status and detect sources of network interference. • Show how to publish device status data on the dashboards • Employ appropriate ways to check and eliminate the impact of network interference. • Demonstrate organisational procedure of generating network usage and traffic statistics to fine any congestion during data transmission and receiving. • Show how to generate machine and various devices power consumption report and machine spare part life utilization report. • Show how to create Markers for defining the machine state as online, offline, ideal, error, busy, program mode etc. • Apply appropriate ways to identify reasons for machine idleness, machine setup activity, machine breakdown activity. • Apply appropriate ways to monitor the warnings, alarms and machine status by creating forced error in the process. • Show how to monitor system logs of the IIoT network. • Prepare a sample production, quality & preventive maintenance plans for local and remote based. • Show how to monitor life of subsystems with user defined limits. • Prepare sample report on machine performance, communication network

	performance, and process performance.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
PCs/Laptops, Internet with Wi-Fi (Min2 Mbps Dedicated) 18 documents of PPAP, Design records, Design Records, Authorized Engineering Change Documents, Customer Engineering Approval, Design Failure Modes and Effects Analysis (DFMEA), applied in special situations, Process Flow Diagram, Process Failure Modes and Effects Analysis (PFMEA) Control Plan, Part Submission Warrant (PSW), Engineering Change Documents Dimensional Results, PLC Simulator, Hydraulic, Pneumatic, Electronic Control Systems Simulator, Internet of Things study material and IOT communication devices, Manufacturing Execution system, manufacturing operation management system. Hydraulics and pneumatics systems simulator, PLC Simulator with required software, Air Cylinders, valves, connector/tubing simulators, Pick and place robots assembly Electronics sensor like proximity, optical, magnetic sensors.	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	4	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	1	Mechanical/ Automobile	NA
B.E/B.Tech	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	5	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	0	Assessment	NA
M.E/M.Tech	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	3	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	1	Assessment	NA

Trainer Certification	
Domain Certification	**Platform Certification**
"Automotive Smart Manufacturing Engineer, ASC/Q8307, version 1.0". Minimum accepted score is 80%.	"Trainer, MEP/Q2601 v1.0" Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	5	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	1	Mechanical/ Automobile	NA
B.E/B.Tech	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	6	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	0	Assessment	NA
M.E/M.Tech	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	4	(Mechanical/ Electrical/ Electronics/ Automobile/ Instrumentation	1	Assessment	NA

Assessor Certification	
Domain Certification	**Platform Certification**
"Automotive Smart Manufacturing Engineer, ASC/Q8307, version 1.0". Minimum accepted score is 80%.	"Assessor; MEP/Q2701 v1.0" Minimum accepted score is 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
    - Assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records

2. Testing Environment:
    - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
    - Check the duration of the training.
    - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
    - If the batch size is more than 30, then there should be 2 Assessors.
    - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
    - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
    - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
    - Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:
    - Question papers created by the Subject Matter Experts (SME)
    - Question papers created by the SME verified by the other subject Matter Experts
    - Questions are mapped with NOS and PC
    - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
    - Assessor must be ToA certified & trainer must be ToT Certified
    - Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:
    - Time-stamped & geotagged reporting of the assessor from assessment location
    - Centre photographs with signboards and scheme specific branding
    - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
    - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:
    - Surprise visit to the assessment location
    - Random audit of the batch
    - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
    - Hard copies of the documents are stored
    - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
    - Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

References

Glossary

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 Outcome	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 task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
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	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

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
SOP	Standard Operating Procedure
WI	Work Instructions
PPE	Personal Protective equipment