Model Curriculum

QP Name: Predictive Maintenance Engineer

QP Code: CSC/Q0902

Version: 1.0

NSQF Level: 5.5

Model Curriculum Version: 1.0

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 and manufacturing
Sub-Sector	Machine Tools, Dies, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery, Electrical and Power Machinery, Light Engineering Goods
Occupation	Maintenance
Country	India
NSQF Level	5.5
Aligned to NCO/ISCO/ISIC Code	2144.0600
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:

- Demonstrate the steps for installing AI devices for performing predictive maintenance at customer premises.
- Perform post installation activities to establish AI connectivity.
- Carry out predictive maintenance using AI devices.
- Optimize resources, work efficiently and adhere to safety standards.
- Interact effectively with others while being sensitive of gender and persons with disabilities.
- 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/N0902 : Conduct regular inspection of machinery and equipment to identify potential issues **NOS Version- 1.0** **NSQF Level- 5.5**	**30:00**	**30:00**	**30:00**	**00:00**	**90:00**
Module 1: Introduction to the role of a CG Robotics & Automation COBOTS Programmer	02:00	00:00	0:00	00:00	02:00
Module 2: Conduct regular inspection of machinery and equipment to identify potential issues	28:00	30:00	30:00	00:00	88:00
CSC/N0909 : Assist in Design, Development and Implementation of predictive maintenance system **NOS Version- 1.0** **NSQF Level- 5.5**	**30:00**	**60:00**	**0:00**	**00:00**	**90:00**
Module 3: Carry out designing, development and implementation of a predictive maintenance	30:00	60:00	0:00	00:00	90:00

system					
CSC/N0910: Perform Data acquisition, and prepare for the process and analysis of acquired data NOS Version-1.0NSQF Level- 5.5	**20:00**	**40:00**	**30:00**	**00:00**	**90:00**
Module 4: Perform Data acquisition, processing and analysis	20:00	40:00	30:00	00:00	90:00
CSC/N0911: Maintain accurate records for Diagnosis and Prognosis based on condition-based monitoring NOS Version- 1.0 NSQF Level- 5.5	**20:00**	**40:00**	**30:00**	**00:00**	**90:00**
Module 5: Maintain accurate records for Diagnosis and Prognosis based on condition-based monitoring	20:00	40:00	30:00	00:00	90:00
CSC/N0912:Determine and Initiate Preventive maintenance Action NOS Version- 1.0 NSQF Level- 5.5	**30:00**	**60:00**	**0:00**	**00:00**	**90:00**
Module 6: Determine and Initiate Maintenance Action	30:00	60:00	0:00	00:00	90:00
CSC/N0913 Review the Predictive Maintenance Program NOS Version- 1.0 NSQF Level- 5.5	**20:00**	**40:00**	**0:00**	**00:00**	**60:00**
Module 7: Review the Predictive Maintenance Program	20:00	40:00	0:00	00:00	60:00
CSCN/0505 - Follow 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: Follow the health and safety practices at the work	10:00	20:00	00:00	00:00	30:00
CSC/N1342- Collaboratively	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**

coordinate with the team **NOS Version- 1.0** **NSQF Level- 6**					
Module 9: Coordinate with co-workers to achieve work efficiency	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 10: 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 Predictive maintenance engineer

Bridge Module, aligned to CSC/N0902 v1.0

Terminal Outcomes:

- Discuss the job role of a Predictive maintenance 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 a Predictive maintenance engineer. • Identify various employment opportunities for a Predictive maintenance engineer.	
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Conduct regular inspection of machinery and equipment to identify potential issues

Bridge Module, aligned to CSC/N0902 v1.0

Terminal Outcomes:

- Conduct regular inspections of machinery and equipment to identify potential issues, ensuring optimal functionality and safety compliance.

Duration: 28:00	**Duration: 60:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the principles and concepts of predictive maintenance, including its significance in optimizing equipment reliability, minimizing downtime, and reducing operational costs. • Explain the various predictive maintenance techniques and technologies such as vibration analysis, infrared thermography, oil analysis, ultrasonic testing, and machine learning algorithms. • Discuss the factors influencing the selection of appropriate predictive maintenance techniques based on equipment type, operating conditions, and industry standards. • Describe the importance of data collection, preprocessing, and analysis in developing accurate predictive maintenance models. • Discuss the role of sensors, IoT devices, and connectivity protocols in real-time data acquisition for predictive maintenance systems. • Explore the ethical and legal considerations related to data privacy, security, and regulatory compliance in implementing predictive maintenance solutions.	• Collect relevant data from machinery and equipment using appropriate sensors, data loggers, and monitoring devices. • Preprocess and clean acquired data to remove noise, outliers, and inconsistencies. • Apply statistical analysis techniques to identify patterns, trends, and anomalies in the dataset. • Utilize machine learning algorithms such as regression, classification, and clustering to develop predictive maintenance models. • Implement data visualization techniques to present insights and findings from predictive maintenance analysis effectively. • Collaborate with cross-functional teams to integrate predictive maintenance solutions into existing enterprise systems and workflows. • Conduct performance evaluation and validation of predictive maintenance models using historical data and real-world scenarios. • Fine-tune and optimize predictive maintenance algorithms to enhance accuracy, reliability, and scalability. • Develop documentation, training materials, and user manuals for end-users and stakeholders involved in the maintenance process. • Demonstrate effective communication

	and teamwork skills in presenting project updates, findings, and recommendations to management and technical teams.
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
Tools, Equipment and Other Requirements	
Vibration Analysis Equipment ,Infrared Thermography Devices ,Ultrasound Detection Equipment , Oil Analysis Kits, Condition Monitoring Sensors , Data Acquisition Systems , Condition Monitoring Software , Training Simulators , Laptops , Personal Protective Equipment	

Module 3: Carry out designing, development and implementation of a predictive maintenance system

Bridge Module, aligned to CSC/N0909 v1.0

Terminal Outcomes:

- Determine the condition data measurement technique and its various aspects
- Select the monitoring techniques and technology (data collection/data acquisition system)
- Develop the optimum routes and plan the resources
- Deploy the system with the right manpower for performing various tasks for Predictive maintenance engineer in capital goods.

Duration: 30:00	**Duration: 60:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define predictive maintenance and its significance in the context of manufacturing organizations. • Explain the principles behind predictive maintenance and its advantages over reactive and preventive maintenance. • Discuss the importance of considering criticality in the design of a predictive maintenance system. • Elaborate different maintenance strategies and choose the most suitable for a given manufacturing setup. • Discuss various techniques for measuring equipment condition data. • Explain the pros and cons of different measurement techniques. • Describe appropriate monitoring techniques and technologies for data collection. • Explain the functionalities and limitations of different data acquisition systems. • Discuss the need to plan resources efficiently, considering manpower, time, and equipment availability. • Describe the steps involved in deploying a predictive maintenance	• Demonstrate proficiency in using various condition monitoring tools. • Collect actual equipment condition data and interpret the results. • Implement a data acquisition system within a controlled environment. • Troubleshoot and address issues that may arise during the technology deployment phase. • Create optimal routes for data collection considering practical constraints. • Implement routing strategies in real-world scenarios. • Plan and allocate resources efficiently for predictive maintenance tasks. • Address challenges related to resource constraints and unexpected disruptions. • Execute the deployment of a predictive maintenance system in a simulated manufacturing environment. • Verify the seamless integration of the system with existing processes. • Conduct training sessions for predictive maintenance engineers. • Assign tasks to the trained personnel

system. • Discuss the need of formulating a training program for the manpower involved in system deployment and operation. • Discuss the importance of keeping oneself updated on the latest trends and advancements in predictive maintenance technologies.	and assess their competency in executing assigned duties. • Establish a process for continuous improvement based on feedback and performance metrics. • Implement modifications and enhancements to the predictive maintenance system as needed. • Maintain comprehensive documentation of the entire design and implementation process. • Generate reports on system performance, equipment health, and maintenance outcomes. • Carry out steps to ensure that all aspects of the predictive maintenance system comply with safety standards. • Implement protocols for emergency situations and ensure the safety of personnel involved.
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
Tools, Equipment and Other Requirements	
Vibration Analysis Equipment ,Infrared Thermography Devices ,Ultrasound Detection Equipment , Oil Analysis Kits, Condition Monitoring Sensors , Data Acquisition Systems , Condition Monitoring Software , Training Simulators , Laptops , Personal Protective Equipment	

Module 4: Perform Data acquisition, processing and analysis

Bridge Module, aligned to CSC/N0910 v1.0

Terminal Outcomes:

- Demonstrate measurement of condition data
- Discuss how to process the data and perform analysis by trending
- Compare measurement to alerts/alarm criteria for the equipment
- Document key findings.

Duration: 20:00	**Duration: 40:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define and explain various data acquisition techniques used in industrial settings for condition monitoring. • Describe the principles behind sensor technologies, signal processing, and instrumentation relevant to data acquisition. • Discuss industry standards related to data acquisition, processing, and analysis for condition monitoring. • Explain compliance requirements and best practices for ensuring data integrity and reliability. • Explain the importance of data normalization and transformation for effective analysis. • Discuss the application of statistical and machine learning techniques for analyzing condition data. • Explain the fundamentals of trend analysis and its application in predictive maintenance. • Define and comprehend criteria for setting alerts and alarms based on equipment condition data. • Describe the significance of deviations from normal operating conditions and the implications for predictive maintenance. • Explain the need of documenting and reporting key findings from data analysis. • Discuss the importance of clear and concise communication to stakeholders. • Explain potential risks associated with data acquisition, processing, and analysis. • Discuss strategies for mitigating risks and ensuring the reliability of condition	• Demonstrate the process of setting up and using various sensors and data acquisition systems. • Demonstrate steps to execute data collection procedures adhering to safety and quality standards. • Apply data processing techniques using software tools commonly used in the industry. • Perform trend analysis on real-world condition data and interpret the results. • Evaluate equipment condition data against predefined alert and alarm criteria. • Develop the ability to identify patterns indicative of potential issues or failures. • Gain practical insights into applying predictive maintenance strategies based on analyzed data. • Develop proficiency in recommending appropriate maintenance actions to prevent equipment failures. • Create comprehensive documentation of the entire data acquisition, processing, and analysis process. • Prepare reports highlighting key findings, trends, and recommendations for predictive maintenance. • Engage in simulation exercises to replicate real-world scenarios for hands-on problem-solving. • Develop the ability to make decisions based on simulated data and implement appropriate actions. • Work collaboratively with peers to analyze complex datasets and discuss findings. • Practice effective communication of results

monitoring outcomes.	to technical and non-technical stakeholders.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Vibration Analysis Equipment ,Infrared Thermography Devices ,Ultrasound Detection Equipment , Oil Analysis Kits, Condition Monitoring Sensors , Data Acquisition Systems , Condition Monitoring Software , Training Simulators , Laptops , Personal Protective Equipment	

Module 5: Maintain accurate records for Diagnosis and Prognosis based on condition-based monitoring

Bridge Module, aligned to CSC/N0911 v1.0

Terminal Outcomes:

- Demonstrate proficiency in identifying critical parameters and variables that influence the diagnostic process.
- Demonstrate the ability to interpret and analyze data from diverse sources to identify potential faults or anomalies.
- Select appropriate diagnostic approaches tailored to the specific characteristics and requirements of the capital goods in question.
- Develop expertise in deciding on prognosis methodologies to predict the future health of critical components or systems.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define and articulate the diagnostic requirements for condition monitoring in industrial equipment and systems. • Describe the significance of adhering to industry standards when establishing diagnostic parameters. • Explain the essential elements involved in diagnostic processes for condition monitoring. • Describe knowledge of sensors, data acquisition systems, and other components used in the diagnostic setup. • Elaborate various diagnostic approaches applicable to different types of industrial equipment. • Discuss the pros and cons of different diagnostic techniques and select the most suitable approach based on specific scenarios. • Describe how to formulate decisions regarding the prognosis of potential faults in industrial equipment. • Describe the role of historical data and predictive analytics in making informed prognostic decisions.	• Design and set up a condition monitoring system by defining specific diagnostic requirements for given industrial equipment. • Configure sensors and data acquisition systems to meet established diagnostic parameters. • Demonstrate installation and utilization of diagnostic elements such as sensors, actuators, and communication interfaces. • Troubleshoot and rectify issues related to the functioning of diagnostic components. • Demonstrate how to implement different diagnostic approaches on industrial equipment models by simulating real-world scenarios . • Interpret diagnostic results and make decisions on the appropriate course of action. • Engage in case studies or simulations to practice making prognostic decisions based on historical data and predictive modeling. • Implement prognostic approaches that facilitate timely identification of potential failures, enabling proactive maintenance

• Describe and apply different prognostic approaches for predicting equipment failures. • Evaluate the effectiveness of different prognostic methods and choose the most appropriate approach based on the context. • Discuss how to create comprehensive reports adhering to industry standards, detailing the condition of monitored equipment and proposed maintenance actions.	interventions. • Utilize predictive analytics and machine learning algorithms to enhance the accuracy of prognostic assessments.. • Utilize predictive maintenance tools and techniques to foresee potential faults in monitored equipment. • Implement and compare various prognostic approaches on actual industrial equipment or realistic simulations. • Demonstrate the ability to create clear and concise documentation of diagnostic and prognostic findings. • Practice presenting findings in both written reports and oral presentations, ensuring adherence to industry standards.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Vibration Analysis Equipment ,Infrared Thermography Devices ,Ultrasound Detection Equipment , Oil Analysis Kits, Condition Monitoring Sensors , Data Acquisition Systems , Condition Monitoring Software , Training Simulators , Laptops , Personal Protective Equipment	

Module 6: Determine and Initiate Preventive Maintenance Action

Bridge Module, aligned to CSC/N0913 v1.0

Terminal Outcomes:

- Determine the need for maintenance action
- Initiate the maintenance action
- Record maintenance activities performed and the equipment condition post maintenance.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define predictive maintenance and its importance in ensuring equipment reliability. • Explain the principles and benefits of condition monitoring in predictive maintenance. • Discuss and interpret relevant industry standards and regulations related to predictive maintenance in capital goods. • Understand various diagnostic techniques used in predictive maintenance, such as vibration analysis, thermography, and oil analysis. • Describe the need of assessing potential risks associated with equipment failure and downtime. • Discuss risk management strategies in the context of predictive maintenance. • Describe how to make informed decisions regarding the need for maintenance actions based on condition monitoring data. • Explain the factors influencing the decision to initiate maintenance, such as equipment criticality and potential consequences of failure.	• Demonstrate the ability to interpret condition monitoring data to assess the health of industrial equipment. • Apply different condition monitoring techniques to gather data from industrial equipment. • Utilize tools and equipment for data collection, including sensors, meters, and monitoring software. • Analyze condition monitoring data to identify trends, anomalies, and potential issues. • Interpret data in the context of industry standards and equipment specifications. • Develop skills to determine the appropriate maintenance actions based on the analysis of condition monitoring data. • Show how to initiate corrective or preventive maintenance activities in accordance with industry best practices. • Demonstrate how to accurately record maintenance activities performed, including details of the tasks, resources used, and time taken. • Document the condition of equipment post-maintenance and any adjustments made to improve performance. • Show how to communicate key findings and maintenance recommendations effectively to relevant stakeholders. • Prepare comprehensive reports documenting the maintenance activities, equipment condition, and any additional recommendations. • Demonstrate a commitment to continuous

	improvement by analyzing the effectiveness of maintenance actions. • Demonstrate how to propose and implement improvements to the predictive maintenance process based on lessons learned and feedback. • Adhere to safety protocols and guidelines while performing maintenance activities.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Vibration Analysis Equipment ,Infrared Thermography Devices ,Ultrasound Detection Equipment , Oil Analysis Kits, Condition Monitoring Sensors , Data Acquisition Systems , Condition Monitoring Software , Training Simulators , Laptops , Personal Protective Equipment	

Module 7: Review the Predictive Maintenance Program

Bridge Module, aligned to CSC/N0913v1.0

Terminal Outcomes:

- Conduct periodic review of the condition monitoring/predictive maintenance program
- Implement periodic actions for the effectiveness and sustenance of the data management.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define and explain the fundamental principles of Predictive Maintenance. • Discuss the industry standards related to Predictive Maintenance. • Describe the importance of compliance with standards in industrial settings. • Discuss strategies for data management in Predictive Maintenance. • Explain the role of data in enhancing equipment reliability and performance. • Discuss skills to conduct systematic reviews of condition monitoring and PdM programs. • Explain key parameters for assessing the effectiveness of maintenance strategies. • Discuss the need of documenting the reviews effectively. • Explain the importance of maintaining accurate records in compliance with regulatory requirements. • Discuss potential risks associated with the condition monitoring program. • Discuss strategies to mitigate risks and enhance program effectiveness. • Describe the importance of clear and concise reporting.	• Demonstrate knowledge of various techniques used in condition monitoring. • Demonstrate the ability to conduct thorough reviews of existing Predictive Maintenance programs. • Implement methodologies for assessing the overall health and efficiency of equipment. • Analyze data collected through condition monitoring techniques. • Interpret data trends to make informed decisions about maintenance strategies. • Propose and implement corrective actions based on review findings. • Demonstrate the ability to improve the effectiveness of the Predictive Maintenance program. • Gain hands-on experience with advanced monitoring tools and technologies. • Apply knowledge of tools to enhance the accuracy of condition assessments. • Collaborate with engineering, operations, and maintenance teams to gather insights. • Demonstrate skills to work in a multidisciplinary environment to optimize maintenance strategies. • Create comprehensive documentation of review findings, corrective actions, and improvements. • Use standardized formats for documentation in accordance with industry best practices. • Develop and implement strategies for continuous improvement in the Predictive Maintenance program. • Identify areas for innovation and optimization to enhance equipment

	reliability.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Vibration Analysis Equipment ,Infrared Thermography Devices ,Ultrasound Detection Equipment , Oil Analysis Kits, Condition Monitoring Sensors , Data Acquisition Systems , Condition Monitoring Software , Training Simulators , Laptops , Personal Protective Equipment	

Module 8: Health and safety Practices

Bridge Module, aligned 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: 20:00	**Duration**: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**

• lain 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 followingthe 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 documentation following a health and safety incident at 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 assistance from 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 changes to 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: Coordinate with co-workers to achieve work efficiency

Bridge Module, aligned to CSC/N1339 v1.0

Terminal Outcomes:

- Create a collaborative and inclusive team environment conducive to effective communication and cooperation.
- Work cooperatively with team members, fostering a positive and productive atmosphere that contributes to achieving team goals.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define and explain the key concepts of team dynamics, including roles, norms, and communication patterns. • Discuss the importance of applying effective communication strategies within a team, considering various communication channels and styles. • Describe the components necessary for creating a positive and productive team environment in the context of a Data Analytics Engineer role. • Describe the importance of collaboration in the field of data analytics. • Define the role of each team member in the decision-making process. • Define and demonstrate a sense of responsibility in the context of a Data Analytics Engineer.	• Conduct a practical team-building exercise to foster collaboration and teamwork. • Demonstrate the experience and identify strategies for building a cohesive team environment. • Participate in a communication simulation, considering various scenarios encountered in a data analytics team. • Receive feedback on communication effectiveness and adapt communication styles accordingly. • Work on a collaborative data analytics project, addressing real-world challenges. • Demonstrate the ability to effectively collaborate with team members to achieve project objectives. • Simulate decision-making scenarios specific to data analytics projects. • Contribute actively to decision-making processes and analyze the impact of decisions on project outcomes. • Take on specific responsibilities within the team, such as project management or task ownership. • Demonstrate a proactive approach to fulfilling responsibilities and meeting project deadlines. • Attend a diversity training workshop to gain insights into respecting diverse opinions, customs, and preferences. • Apply the knowledge gained to enhance collaboration within the team, considering cultural and professional diversity.
Classroom Aids	

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop
Tools, Equipment and Other Requirements
Load Cells, Strain Gauges, Transducers, Mechanical Governors, Pressure Gauges, Micrometers, Jigs and Fixtures, Templates and Patterns, Insulation Testers, Vernier Calliper, Dead Weight Tester, Manometers, Gyroscope, Screw Driver, Testers etc.

Module 10: Employability Skills

Bridge module,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 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 browsing, using various social media platforms, e-mails, etc., safely and securely	• 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, safely and securely • Operate digital devices and use the associated applications and features, safely

• 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	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	

Trainer Requirements

Annexure

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

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "**Predictive Maintenance Engineer"** mapped to QP: "CSC/Q0902, 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	Degreein Electrical/ Mechatronics/ Mechanical Engineering	7		0		Practical skills and knowledge required in the relevant field

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "**Predictive Maintenance Engineer** " mapped to QP: "CSC/Q0902 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