Model Curriculum

QP Name: CNC Turning

QP Code: CSC/Q0418

Version: 1.0

NSQF Level: 4.5

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

Table of Contents

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	4.5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification and Experience	Completed 1st year of UG OR Pursuing 1st year of UG and continuous education OR Pursuing 3rd year of 3-year diploma after 10th and continuous education OR Pursuing 2nd year of 2- year diploma after 12 and continuous education OR 10th Grade pass with 1 year NTC plus 1 year NAC plus 1 year CITS OR 10th grade pass with 1 year NTC plus CITS with 1 year of relevant experience OR 8th Grade pass with 2 year NTC plus 1 year NAC plus 1 year CITS with 1 year of relevant experience OR Previous relevant Qualification of NSQF Level 3.5 and with minimum education as 8th Grade pass with 3 year relevant experience OR Previous relevant Qualification of NSQF Level 4 and with minimum education as 8th Grade pass with 1.5 year relevant experience
Pre-Requisite License or Training	NA
Minimum Job Entry Age	22 Years
Last Reviewed On	
Next Review Date	

NSQC Approval Date	
QP Version	1.0
Model Curriculum Creation Date	
Model Curriculum Valid Up to Date	
Model Curriculum Version	1.0
Minimum Duration of the Course	510 Hours
Maximum Duration of the Course	510 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:

- Interpret engineering drawings and following the specifications
- Generate the processes and programs with the CAD/CAM system and/or G and M-codes
- Set up the tools, work holding devices, and work pieces on the CNC Turning centre
- Manipulate cutting conditions, based on the properties of the material and tools
- Operate, inspect, and maintain the accuracy of dimensions within the specified tolerances
- Optimize the process, taking into account the production type: whether large quantities of one-part, small batches, or one-of-a-kind items.

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/N0455 Work organization and management NOS Version- 1.0 NSQF Level- 4.5	**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: Work organization and management	18:00	40:00	0:00	00:00	58:00
CSC/N0456: Interpret engineering drawings(turning) NOS Version-1.0 NSQF Level- 4.5	**10:00**	**20:00**	**0:00**	**00:00**	**30:00**
Module 3: Interpret engineering drawings and follow the specification	10:00	20:00	0:00	00:00	30:00
CSC/N0457: Process planning(turning)	**30:00**	**60:00**	**0:00**	**00:00**	**90:00**

NOS Version- 1.0 **NSQF Level- 4.5**					
Module 4: Perform Process planning	30:00	60:00	0:00	00:00	90:00
CSC/N0458 **Programming(turning)** **NOS Version- 1.0** **NSQF Level- 4.5**	**40:00**	**50:00**	**0:00**	**00:00**	**90:00**
Module 5: Programming	40:00	50:00	0:00	00:00	90:00
CSC/N0461 **Performing metrology and inspection on the workpiece** **NOS Version- 1.0** **NSQF Level- 4.5**	**20:00**	**40:00**	**0:00**	**00:00**	**60:00**
Module 6: Metrology	20:00	40:00	0:00	00:00	60:00
CSC/N0452 **Setting and operating CNC lathes** **NOS Version- 1.0** **NSQF Level- 4.5**	**20:00**	**40:00**	**0:00**	**00:00**	**60:00**
Module 7: Setting and operating CNC lathes	20:00	40:00	0:00	00:00	60:00
CSC/N0453 **Finalize and deliver work pieces** **NOS Version- 1.0** **NSQF Level- 4.5**	**10:00**	**20:00**	**0:00**	**00:00**	**60:00**
Module 8: Finalize and deliver work pieces	10:00	20:00	0:00	00:00	60:00
Total Duration	**150:00**	**270:00**	**90:00**	**00:00**	**570:00**

Module Details

Module 1: Introduction to the role of CNC Milling

Bridge Module aligned to CSC/N0455 V1.0

Terminal Outcomes:

- Discuss the job role of CNC Milling.

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 CNC Milling. • Identify various employment opportunities for CNC Milling.	
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Work organization and management

Bridge Module aligned to CSC/N0455 V1.0

Terminal Outcomes:

- Apply principles of time management and resource allocation to optimize production.
- Understand the importance of safety protocols and adhere to industry standards.

Duration: 18:00	**Duration: 40:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain principles of workspace organization for optimal safety and performance. • Identify key elements of an organized workspace. • Explain the importance of ergonomic design in a workspace. • Recognize the factors affecting the condition and functionality of workspaces, equipment, tools, and materials. • Develop skills to perform regular checks on equipment and tools. • Explain the significance of maintaining a well-functioning workspace. • Explain the relevance of quality standards and regulations in CNC turning. • Demonstrate the ability to interpret and apply quality standards. • Identify consequences of non-compliance with quality regulations. • Explain the principles of health and safety in a manufacturing environment. • Promote and apply best practices for maintaining a safe working environment. • Demonstrate knowledge of emergency procedures. • Learn the principles of safe operation of CNC lathes.	• Arrange the workspace for optimal safety and performance. • Implement ergonomic principles in the layout of CNC turning workstations. • Perform regular checks on CNC lathe equipment and tools. • Identify and report any issues affecting workspace conditions. • Apply quality standards in CNC turning processes. • Conduct quality checks during and after machining operations. • Implement health and safety protocols in daily work activities. • Participate in safety drills and emergency response simulations. • Set up and operate CNC lathes adhering to safety guidelines. • Implement energy-efficient practices during CNC turning operations. • Use specialized software for CNC programming and simulation. • Troubleshoot software-related issues independently. • Apply mathematical calculations for CNC programming. • Demonstrate precision in machining using geometrical principles. • Select and apply cutting technology based on material specifications. • Optimize cutting processes for

• Demonstrate the ability to set up CNC lathes safely. • Implement environmentally friendly practices, such as energy management. • Gain proficiency in using computer-related professional software relevant to CNC turning. • Demonstrate competence in tasks such as programming and data analysis using specialized software. • Apply mathematical principles in programming processes for CNC turning. • Utilize geometrical principles for precision in machining processes. • Solve practical problems using mathematical and geometrical concepts. • Explain the factors influencing the selection of cutting technology. • Demonstrate the ability to choose appropriate cutting technology for specific materials and equipment. • Identify environmental considerations in cutting technology selection. • Interpret and apply instructions provided by equipment manufacturers. • Demonstrate the importance of adherence to manufacturers' guidelines for safe and effective operation. • Develop proficiency in finding relevant data in handbooks, tables, and charts. • Apply information retrieval skills to solve problems and make informed decisions. • Demonstrate the ability to extract and utilize data from various sources.	efficiency and material conservation. • Follow manufacturers' instructions for the setup and operation of CNC lathes. • Troubleshoot equipment issues using provided guidelines. • Retrieve and apply relevant data from handbooks, tables, and charts. • Demonstrate proficiency in data-driven decision-making during CNC turning operations.
Classroom Aids	

Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.
Tools, Equipment and Other Requirements
CNC Turning Machine: CNC lathe or turning center. Cutting Tools: Turning inserts, Boring bars, Threading tools Tool Holders: Turning tool holders, Boring bar holders, Threading tool holders Workholding Devices: Chuck or collet systems, Faceplates, Mandrels Measuring Instruments: Calipers, Micrometers, Dial indicators Cutting Fluids and Lubricants: Coolants for temperature control and chip evacuation, Lubricants for tool and machine maintenance Tool Presetter, Tool cabinets or tool cribs to keep tools organized and easily accessible, Chip conveyor or chip auger for efficient chip removal, Personal protective equipment (PPE), Machine guards, CAM software for creating turning toolpaths.

Module 3: Interpret engineering drawings and follow the specification

Bridge Module aligned to CSC/N0456 V1.0

Terminal Outcomes:

- Interpret engineering drawings accurately and identify key features.
- Follow specifications outlined in engineering drawings to produce precise CNC turning outputs.

Duration: 10:00	**Duration: 20:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the symbols, notations, and conventions used in engineering drawings. • Demonstrate the ability to interpret different views (e.g., orthographic, isometric) of engineering drawings. • Explain the importance of adhering to drawing specifications in CNC turning processes. • Comprehend the significance of dimensions in engineering drawings. • Discuss how to accurately locate and identify dimensions of features such as diameters, lengths, and depths on engineering drawings. • Explain the tolerances associated with dimensions and their impact on CNC turning processes. • Explain and interpret surface finish symbols and requirements on engineering drawings. • Explain the influence of surface finish on the functionality and quality of CNC turned parts. • Describe how to select appropriate tools and machining parameters to achieve specified surface finishes. • Explain geometric dimensioning and tolerancing (GD&T) principles. • Identify and interpret geometric specifications, such as concentricity, parallelism, and perpendicularity, on engineering drawings. • Explain GD&T concepts to CNC turning processes for precision and accuracy. • Discuss the need of ability to visualize and create accurate 3D mental representations of parts based on 2D engineering drawings. • Explain the correlation between 2D representations and the actual 3D geometry of CNC turned components. • Apply spatial reasoning skills to anticipate	• Apply engineering drawing specifications to set up CNC turning machines. • Demonstrate the ability to adjust machining parameters based on drawing requirements. • Use measurement tools accurately to locate and verify dimensions on CNC turned parts. • Demonstrate steps to adjust machining setups to meet specified dimensional requirements. • Implement appropriate cutting tools and speeds to achieve required surface finishes. • Inspect and validate surface finishes using appropriate metrology tools. • Use measuring tools and inspection techniques to verify geometric tolerances. • Utilize CAD/CAM software to create 3D models from 2D engineering drawings. • Verify the accuracy of CNC programs by simulating machining processes. • Identify materials using practical techniques such as material testing, visual inspection, or markings. • Select appropriate cutting tools and machining parameters based on material characteristics. • Develop and implement standard operating procedures for critical sequences. • Train and educate team members on safe practices during critical machining operations. • Conduct risk assessments and implement preventive measures to ensure safety.

challenges in the CNC turning process. • Explain how to identify common materials used in CNC turning. • Explain the impact of material properties on machining processes and tool selection. • Explain the concept of critical sequences in CNC turning. •	
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
CNC Turning Machine: CNC lathe or turning center. Cutting Tools: Turning inserts, Boring bars, Threading tools Tool Holders: Turning tool holders, Boring bar holders, Threading tool holders Workholding Devices: Chuck or collet systems, Faceplates, Mandrels Measuring Instruments: Calipers, Micrometers, Dial indicators Cutting Fluids and Lubricants: Coolants for temperature control and chip evacuation, Lubricants for tool and machine maintenance Tool Presetter, Tool cabinets or tool cribs to keep tools organized and easily accessible, Chip conveyor or chip auger for efficient chip removal, Personal protective equipment (PPE), Machine guards, CAM software for creating turning toolpaths.	

Module 4: Process planning

Bridge Module aligned to CSC/N0457 V1.0

Terminal Outcomes:

- Develop a systematic approach to process planning for CNC turning operations.
- Create comprehensive plans that consider material properties, tool selection, and machining sequences.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the capabilities of the workshop environment, considering factors such as size of batch and complexity of work. • Describe how to evaluate workshop resources and select appropriate solutions based on available capacities. • Describe suitable machining and measuring processes for each feature of a work-piece. • Explain the principles behind selecting specific processes based on the requirements of the job. • Discuss the need to identify, prepare, and calibrate measuring tools. • Explain the importance of precision in measurement and its impact on the overall machining process. • Identify and select appropriate cutting tools based on the characteristics of the material and the desired outcome. • Discuss the impact of tool selection on the efficiency and quality of CNC turning processes. • Explain critical sections in the machining process with a high risk of damage or unsafe practices. • Develop alternatives and safe practices to mitigate risks and avoid accidents. • Encourage learners to find innovative solutions to technical issues within	• Apply knowledge of workshop capacities to propose practical solutions for CNC turning projects. • Demonstrate the ability to implement selected machining and measuring processes on actual work-pieces. • Apply work holding methods practically to secure work-pieces during CNC turning operations. • Demonstrate steps to calibrate measuring tools accurately for use in CNC turning applications. • Implement the use of appropriate cutting tools on CNC turning machines based on material and project requirements. • Demonstrate safe practices in handling critical sections and implement alternative approaches to avoid accidents or damage. • Engage in real-world problem-solving exercises to find innovative solutions to technical challenges encountered in CNC turning. • Implement alternative solutions that prove reliable throughout each CNC turning process. • Plan and execute operations and sequences according to specified data, emphasizing efficiency and precision. • Participate in decision-making simulations that involve weighing solutions and making informed

the CNC turning environment. • Discuss and evaluate alternative solutions based on reliability, considering factors such as speed, safety, price, and sustainability. • Discuss the importance of making informed decisions on the most suitable approaches for CNC turning processes. • Discuss how to plan operations and sequences (machining strategy) based on specified data. • Describe how to create a comprehensive and efficient plan for CNC turning operations. •	choices for CNC turning projects. • Participate in drills and practical sessions focused on critical operations where no alternative is available, ensuring readiness and awareness.

Classroom Aids

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop

Tools, Equipment and Other Requirements

CNC Turning Machine: CNC lathe or turning center.

Cutting Tools: Turning inserts, Boring bars, Threading tools

Tool Holders: Turning tool holders, Boring bar holders, Threading tool holders

Workholding Devices: Chuck or collet systems, Faceplates, Mandrels

Measuring Instruments: Calipers, Micrometers, Dial indicators

Cutting Fluids and Lubricants: Coolants for temperature control and chip evacuation, Lubricants for tool and machine maintenance

Tool Presetter, Tool cabinets or tool cribs to keep tools organized and easily accessible, Chip conveyor or chip auger for efficient chip removal, Personal protective equipment (PPE), Machine guards, CAM software for creating turning toolpaths.

Module 5: Programming of CNC Machines for turning operation

Bridge Module aligned to CSC/N0458 V1.0

Terminal Outcomes:

- Write and edit CNC programs for turning machines using industry-standard languages.
- Troubleshoot and debug CNC programs to ensure accurate execution.

Duration: 40:00	Duration: 50:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain various production types in CNC turning, such as batch production, mass production, and one-off production. • Describe part specifications to determine the best methods for CNC turning, considering factors like material properties, tolerances, and geometric complexity. • Describe the use of CNC turning software for programming, simulation, and toolpath optimization. • Explain the hardware components involved in CNC turning machines and their functions. • Explain the role of Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) systems in CNC turning. • Explain how to generate CNC programs using CAD/CAM software, translating design specifications into machine instructions. • Explain the syntax and structure of CNC turning programming languages. • Discuss how to create and edit CNC programs directly on the machine-control panel, including commands for tool movements, spindle speed, and feed rates. • Explain the importance of real-time program editing in CNC turning operations. • Discuss how to make on-the-fly adjustments to running programs using CAD/CAM systems and reload modified programs to the machine-control. • Emphasize the importance of documentation in CNC turning, including version control and change logs for programs. • Demonstrate the ability to document optimizations made during CNC turning	• Identify and select appropriate CNC turning methods for specific production scenarios and part specifications. • Analyze sample parts to determine the most efficient production approach. • Operate CNC turning software to create, simulate, and optimize programs. • Familiarize with the hardware components of CNC turning machines and their functions through hands-on experience. • Generate CNC programs using CAD/CAM systems for a variety of CNC turning projects. • Debug and troubleshoot programming issues in a simulated environment. • Practice creating and editing CNC programs directly on the machine-control panel. • Implement basic and intermediate CNC turning commands for toolpath generation. • Simulate and execute CNC turning operations, making real-time adjustments to running programs. • Reload modified programs to the machine-control system and observe the impact on machining processes. • Create comprehensive documentation for CNC turning programs, including annotations for optimizations made during machining. • Use version control systems to manage and upload optimized CNC programs to the company server.

processes and upload the optimized CNC program to the company server.	
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
CNC Turning Machine: CNC lathe or turning center. Cutting Tools: Turning inserts, Boring bars, Threading tools Tool Holders: Turning tool holders, Boring bar holders, Threading tool holders Workholding Devices: Chuck or collet systems, Faceplates, Mandrels Measuring Instruments: Calipers, Micrometers, Dial indicators Cutting Fluids and Lubricants: Coolants for temperature control and chip evacuation, Lubricants for tool and machine maintenance Tool Presetter, Tool cabinets or tool cribs to keep tools organized and easily accessible, Chip conveyor or chip auger for efficient chip removal, Personal protective equipment (PPE), Machine guards, CAM software for creating turning toolpaths.	

Module 6: Performing meteorology and inspection on the workpiece

Bridge Module aligned to CSC/N0461 V1.0

Terminal Outcomes:

- Conduct meteorological assessments to ensure optimal machining conditions.
- Perform inspections on workpieces using appropriate measuring tools and techniques.

Duration: 20:00	**Duration: 40:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define metrology and its importance in CNC turning. • Explain the basic principles of measurement and precision in machining. • Identify and classify various measuring instruments used in CNC turning. • Describe the principles of operation for commonly used measuring tools. • Explain the factors influencing the selection of measuring instruments for different applications in CNC turning. • Develop criteria for selecting appropriate measuring tools based on specific job requirements. • Explain the concept of calibration and its significance in ensuring accurate measurements. • Describe different calibration techniques for measuring instruments used in CNC turning. • Describe the methods for measuring linear, angular, and diametrical dimensions. • Explain the principles of coordinate measuring machines (CMMs) and their applications. • Discuss the product blueprints and specifications to determine measurement points. • Discuss the importance of developing strategies for using measuring tools to measure all features of CNC turned products accurately. • Differentiate between ferrous and non-ferrous materials commonly used in CNC turning. • Explain the properties, advantages, and limitations of each material type. • Elaborate the applications of ferrous and non-ferrous materials in CNC turning.	• Demonstrate the proper handling and care of various measuring instruments. • Practice safety protocols when using measuring tools in a CNC turning environment. • Select appropriate measuring instruments based on given CNC turning tasks. • Set up and prepare the selected instruments for accurate measurements. • Perform calibration exercises for common measuring tools, ensuring accuracy and repeatability. • Identify and rectify calibration errors to maintain precision in measurements. • Use selected tools to measure critical dimensions on CNC turned components. • Interpret measurement data to ensure compliance with specified tolerances. • Identify ferrous and non-ferrous materials commonly used in CNC turning. • Demonstrate proper handling, storage, and preparation techniques for these materials. • Conduct experiments to observe the impact of material properties on tool wear. • Implement maintenance practices to extend tool life and improve machining efficiency. • Analyze real-world case studies involving metrology challenges in CNC turning. • Develop solutions and strategies for overcoming measurement-related issues. • Record and document measurement data accurately. • Prepare comprehensive reports on measurements, calibrations, and material analyses.

• Explain the guidelines for the proper handling, storage, and preparation of materials before machining. • Explain the impact of material properties on tool wear. • Develop strategies for maintaining and monitoring tool condition during CNC turning operations.	

Classroom Aids
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop
Tools, Equipment and Other Requirements
CNC Turning Machine: CNC lathe or turning center. Cutting Tools: Turning inserts, Boring bars, Threading tools Tool Holders: Turning tool holders, Boring bar holders, Threading tool holders Workholding Devices: Chuck or collet systems, Faceplates, Mandrels Measuring Instruments: Calipers, Micrometers, Dial indicators Cutting Fluids and Lubricants: Coolants for temperature control and chip evacuation, Lubricants for tool and machine maintenance Tool Presetter, Tool cabinets or tool cribs to keep tools organized and easily accessible, Chip conveyor or chip auger for efficient chip removal, Personal protective equipment (PPE), Machine guards, CAM software for creating turning toolpaths.

Module 7: Setting and operating CNC lathes

Bridge Module aligned to CSC/N0452 V1.0

Terminal Outcomes:

- Gain a deep understanding of the operations and capabilities of CNC turning machines.
- Demonstrate proficiency in machine setup, tool changes, and operational adjustments.

Duration: 20:00	Duration: 40:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain and analyze different process strategies in CNC turning. • Explain how to select appropriate process strategies based on material, tooling, and desired outcomes. • Discuss and evaluate external CNC programs for turning operations. • Discuss the importance of following and executing given process strategies efficiently. • Discuss the importance of proficiency in uploading CNC programs to CNC lathes. • Describe the process of conducting test runs to ensure the accuracy and feasibility of the programmed instructions. • Describe and classify various machining processes applicable to CNC turning. • Explain the purpose and application of each machining process. • Discuss the technique of mounting and aligning cutting tools on CNC lathes. • Ensure proper tool geometry and alignment for efficient machining. • Discuss how to skillfully mount and align work holding devices on CNC lathes. • Explain the role of accessories like tailstocks and parts-catchers in CNC turning. • Proficiently mount and align these accessories for enhanced machining capabilities. • Describe the factors leading to vibration in CNC turning. • Implement strategies to minimize or eliminate vibration during machining sequences. • Explain the causes and types of burrs in turning operations.	• Adjust cutting parameters to optimize machining strategies for different materials. • Maximize efficiency while maintaining quality standards. • Develop the ability to identify and troubleshoot common issues during CNC turning. • Respond promptly to emergencies to minimize downtime and potential damage. • Accurately measure and assess dimensions, geometries, and surface roughness of turned parts. • Utilize appropriate measuring tools and techniques. • Identify deviations between the machined part and the blueprint. • Apply corrective measures to achieve the specified dimensions and tolerances. • Recognize potential health, safety, and environmental hazards in the CNC turning environment. • Communicate and report issues to ensure a safe and compliant working environment. • Detect and diagnose equipment failures during CNC turning operations. • Report issues promptly to maintenance personnel for timely resolution.

• Discuss effective techniques for the removal of burrs to achieve desired surface finish.	
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
CNC Turning Machine: CNC lathe or turning center. Cutting Tools: Turning inserts, Boring bars, Threading tools Tool Holders: Turning tool holders, Boring bar holders, Threading tool holders Workholding Devices: Chuck or collet systems, Faceplates, Mandrels Measuring Instruments: Calipers, Micrometers, Dial indicators Cutting Fluids and Lubricants: Coolants for temperature control and chip evacuation, Lubricants for tool and machine maintenance Tool Presetter, Tool cabinets or tool cribs to keep tools organized and easily accessible, Chip conveyor or chip auger for efficient chip removal, Personal protective equipment (PPE), Machine guards, CAM software for creating turning toolpaths.	

Module 8: Finalize and deliver work pieces

Bridge Module aligned to CSC/N0453 V1.0

Terminal Outcomes:

- Interpret and adjust machining parameters for CNC turning processes.
- Predict and control machining outcomes based on parameter adjustments.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Identify different types of burrs and their potential impact on the final product. • Explain the importance of cleanliness in CNC turning processes to ensure product quality. • Explain the use of various cleaning and deburring tools and techniques. • Explain the significance of final optical and measurement checks in CNC turning. • Describe how to use precision measuring instruments such as calipers, micrometers, and optical comparators. • Explain measurement data to ensure components meet specified tolerances. • Explain the organization's delivery protocols for parts, drawings, and digital memory devices. • Explain the use of proper packaging and labeling techniques for safe transportation. • Discuss the documentation requirements and communication protocols during deliveries. • Describe different types of tools, clamping devices, and machine accessories used in CNC turning. • Demonstrate proper techniques for dismounting tools and accessories without causing damage. • Explain the importance of tool maintenance and storage. • Elaborate the importance of maintaining a clean machine and workplace for safety and efficiency. • Discuss the use of suitable cleaning materials and techniques for CNC turning equipment. • Describe proper disposal methods for	• Demonstrate proficiency in using cleaning and deburring tools. • Practice removing burrs from different types of materials. • Perform a visual inspection to ensure cleanliness. • Use precision measuring instruments to check dimensions of finished products. • Perform optical checks to identify surface imperfections or irregularities. • Make adjustments or corrections based on measurement data. • Package and label finished products according to organizational standards. • Simulate the delivery process, including communication with relevant personnel. • Verify completeness and accuracy of documentation before delivery. • Safely dismount various tools and accessories from CNC turning equipment. • Inspect tools for wear and damage. • Follow proper storage procedures for tools and accessories. • Perform a thorough cleanup of the CNC turning machine and surrounding workspace. • Dispose of waste materials according to safety and environmental guidelines. • Ensure all surfaces are free from debris and contaminants. • Follow a checklist or procedure to set CNC turning environments to their initial state. • Conduct safety checks and verify equipment readiness. • Organize tools and materials for easy access in the next job. • Practice documenting CNC programs,

waste generated during the machining process. • Explain the sequence and steps involved in setting CNC turning environments to their initial state. • Learn about safety checks and procedures to follow before starting a new job. • Develop the ability to organize and store tools and materials efficiently. • Explain the purpose of documenting CNC programs, work-holding, and tooling information. • Learn methods for organizing and saving CNC programs for future reference. • Demonstrate proficiency in digital data management and storage practices.	work-holding, and tooling information accurately. • Save and organize digital files using the organization's file management system. • Verify the integrity of saved data for future use.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
CNC Turning Machine: CNC lathe or turning center. Cutting Tools: Turning inserts, Boring bars, Threading tools Tool Holders: Turning tool holders, Boring bar holders, Threading tool holders Workholding Devices: Chuck or collet systems, Faceplates, Mandrels Measuring Instruments: Calipers, Micrometers, Dial indicators Cutting Fluids and Lubricants: Coolants for temperature control and chip evacuation, Lubricants for tool and machine maintenance Tool Presetter, Tool cabinets or tool cribs to keep tools organized and easily accessible, Chip conveyor or chip auger for efficient chip removal, Personal protective equipment (PPE), Machine guards, CAM software for creating turning toolpaths.	

Annexure

Trainer Requirements

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: "**CNC Turning**"mapped to QP: "CSC/Q0418, 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: "**CNC Turning**"mapped to QP: "CSC/Q0418, v1.0". Minimum accepted score is 80%	Certified for the Job Role: "Assessor(VET and skills), mapped to the Qualification Pack: "MEP/Q2701, V1.0", 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, Explain 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, Explaining (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, Explainand be able to do **upon the completion of the training**.
Terminal Outcome	The terminal outcome is a statement of what a learner will know, Explain and be able to do **upon the completion of a module.** A set ofterminal 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