CNC Turning

QP Code: CSC/Q0418

Version: 1.0

NSQF Level: 4.5

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CSC/Q0418: CNC Turning

Brief Job Description

A CNC turning operator is responsible for setting up, operating, and maintaining CNC lathes to produce precision parts. They interpret technical drawings, select appropriate cutting tools, and program the machine to achieve the desired specifications. The operator monitors the machining process, makes adjustments as necessary, and inspects finished parts to ensure quality standards are met.

Personal Attributes

A CNC turning operator must possess keen attention to detail to ensure precise machining, along with strong technical skills for programming and machine operation. Problem-solving abilities are crucial for troubleshooting any issues that arise during production. Adaptability to different materials and part specifications, coupled with a collaborative attitude, facilitates efficient teamwork.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. CSC/N0455: Work organization and management (turning)
2. CSC/N0456: Interpret engineering drawings(turning)
3. CSC/N0457: Process planning(turning)
4. CSC/N0458: Programming (turning)
5. CSC/N0461: Performing metrology and inspection on the workpiece
6. CSC/N0452: Setting and operating CNC lathes
7. CSC/N0453: Finalize and deliver work pieces

Qualification Pack (QP) 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
Credits	16
Aligned to NCO/ISCO/ISIC Code	NCO-2015
Minimum Educational Qualification & Experience	Completed 1st year of UG (UG Certificate) (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)
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	22 Years
Last Reviewed On	NA
Next Review Date	NA
NSQC Approval Date	
Version	1.0

CSC/N0455: Work organization and management (turning)

Description

Work organization and management involves scheduling tasks, allocating resources, delegating responsibilities, monitoring progress, and problem-solving. This role requires strong organizational, communication, and leadership skills. It is essential for ensuring efficiency, productivity, and successful project outcomes across various industries.

Scope

The scope covers the following :

- The scope of work organization and management includes scheduling tasks, allocating resources, delegating responsibilities, monitoring progress, and problem-solving. This role is essential for ensuring efficiency, productivity, and successful project outcomes. It requires strong organizational, communication, and leadership skills, as well as the ability to analyze data and make informed decisions.

Elements and Performance Criteria

Work organization and management (turning)

To be competent, the user/individual on the job must be able to:

PC1. Organize the workspace for optimal safety and performance

PC2. Check the condition and functionality of the workspace, equipment, tools and materials

PC3. Apply a thorough knowledge and understanding of mathematics, physics and geometry to CAD projects

PC4. Promote and apply health and safety regulations and best practice

PC5. Set up and operate CNC lathes safely and environmentally well managed (e.g. in use of energy)

PC6. Use computer related professional software

PC7. Apply mathematical and geometrical principles for programming processes

PC8. Select and apply appropriate cutting technology for the material, equipment and cutting tools provided

PC9. Interpret and apply manufacturers' instructions

PC10. Find appropriate data in handbooks, tables, and charts

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. familiarity with standards such as ASME Y14.5 for dimensioning and tolerancing, and ISO 128 for technical drawings.

KU2. Understanding symbols and concepts used to specify geometric characteristics of parts.

KU3. Knowledge of materials properties and various manufacturing methods to ensure designs are feasible and cost-effective.

KU4. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) to create, modify, and interpret technical drawings.

KU5. Ability to understand complex engineering drawings, including views, sections, and annotations.

KU6. Effective communication with engineers, designers, and other stakeholders to clarify specifications and resolve issues.

KU7. Understanding of quality control processes to ensure that final products meet specified requirements.

KU8. Ability to identify and resolve discrepancies between drawings and specifications.

KU9. Thoroughness in reviewing drawings and specifications to ensure accuracy and compliance.

KU10. Awareness of safety standards and regulations relevant to the industry.

KU11. Understanding of cutting tools, feeds and speeds, and machining strategies for CNC turning and milling.

KU12. Knowledge of G-code programming for CNC machines to set up and operate them effectively.

KU13. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) for mechanical design, drafting, and creating detailed drawings.

KU14. Understanding of materials used in manufacturing and their properties to select the appropriate ones for specific applications.

KU15. Knowledge of geometric dimensioning and tolerancing (GD&T) to interpret engineering drawings accurately.

KU16. Awareness of safety standards and regulations relevant to CNC machining and mechanical CAD design.

KU17. Understanding of quality control processes to ensure that manufactured parts meet specifications.

KU18. Ability to troubleshoot issues related to CNC machining, tooling, or CAD designs.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Understanding of machining principles, CAD software, and mechanical systems.

GS2. Precision in machining and CAD design to ensure accuracy of parts and drawings.

GS3. Ability to troubleshoot issues with CNC machines, tooling, or CAD designs.

GS4. Collaboration with engineers, designers, and other team members to achieve project goals.

GS5. Efficient use of time to meet project deadlines and production schedules.

GS6. Effective communication of ideas and requirements with team members and stakeholders.

GS7. Flexibility to work with different materials, designs, and machining requirements.

GS8. Adherence to safety protocols and practices in CNC machining and CAD design environments.

GS9. Willingness to stay updated with new technologies and techniques in CNC machining and CAD design.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Work organization and management (turning)	**20**	**30**	**-**	**-**
PC1. Organize the workspace for optimal safety and performance	-	-	-	-
PC2. Check the condition and functionality of the workspace, equipment, tools and materials	-	-	-	-
PC3. Apply a thorough knowledge and understanding of mathematics, physics and geometry to CAD projects	-	-	-	-
PC4. Promote and apply health and safety regulations and best practice	-	-	-	-
PC5. Set up and operate CNC lathes safely and environmentally well managed (e.g. in use of energy)	-	-	-	-
PC6. Use computer related professional software	-	-	-	-
PC7. Apply mathematical and geometrical principles for programming processes	-	-	-	-
PC8. Select and apply appropriate cutting technology for the material, equipment and cutting tools provided	-	-	-	-
PC9. Interpret and apply manufacturers' instructions	-	-	-	-
PC10. Find appropriate data in handbooks, tables, and charts	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0455
NOS Name	Work organization and management (turning)
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
NSQF Level	4.5
Credits	2
Version	1.0
Next Review Date	NA

CSC/N0456: Interpret engineering drawings(turning)

Description

Interpreting engineering drawings for turning involves reading and understanding detailed specifications, selecting appropriate tools and materials, and ensuring finished parts meet quality standards. This role requires proficiency in interpreting drawings, knowledge of turning operations, and attention to detail.

Scope

The scope covers the following :

- The scope of interpreting engineering drawings for turning includes reading and understanding complex technical specifications, identifying machining requirements, selecting appropriate tools and materials, and ensuring finished parts meet quality standards. This role is essential for the accurate and efficient production of machined components in various industries.

Elements and Performance Criteria

Interpret engineering drawings(turning)

To be competent, the user/individual on the job must be able to:

PC1. Interpret engineering drawings and apply to specifications

PC2. Locate and identify dimensions of features

PC3. Locate and identify surface finish requirements

PC4. Locate and identify geometric specifications

PC5. Make 3D metal representations of the parts

PC6. Identify the materials that parts are made of

PC7. Identify critical sequences (with a high possibility of damage or unsafe practice) and develop appropriate approaches

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. familiarity with standards such as ASME Y14.5 for dimensioning and tolerancing, and ISO 128 for technical drawings.

KU2. Understanding symbols and concepts used to specify geometric characteristics of parts.

KU3. Knowledge of materials properties and various manufacturing methods to ensure designs are feasible and cost-effective.

KU4. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) to create, modify, and interpret technical drawings.

KU5. Ability to understand complex engineering drawings, including views, sections, and annotations.

KU6. Effective communication with engineers, designers, and other stakeholders to clarify specifications and resolve issues.

KU7. Understanding of quality control processes to ensure that final products meet specified requirements.

KU8. Ability to identify and resolve discrepancies between drawings and specifications.

KU9. Thoroughness in reviewing drawings and specifications to ensure accuracy and compliance.

KU10. Awareness of safety standards and regulations relevant to the industry.

KU11. Understanding of cutting tools, feeds and speeds, and machining strategies for CNC turning and milling.

KU12. Knowledge of G-code programming for CNC machines to set up and operate them effectively.

KU13. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) for mechanical design, drafting, and creating detailed drawings.

KU14. Understanding of materials used in manufacturing and their properties to select the appropriate ones for specific applications.

KU15. Knowledge of geometric dimensioning and tolerancing (GD&T) to interpret engineering drawings accurately.

KU16. Awareness of safety standards and regulations relevant to CNC machining and mechanical CAD design.

KU17. Understanding of quality control processes to ensure that manufactured parts meet specifications.

KU18. Ability to troubleshoot issues related to CNC machining, tooling, or CAD designs.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Understanding of machining principles, CAD software, and mechanical systems.

GS2. Precision in machining and CAD design to ensure accuracy of parts and drawings.

GS3. Ability to troubleshoot issues with CNC machines, tooling, or CAD designs.

GS4. Collaboration with engineers, designers, and other team members to achieve project goals.

GS5. Efficient use of time to meet project deadlines and production schedules.

GS6. Effective communication of ideas and requirements with team members and stakeholders.

GS7. Flexibility to work with different materials, designs, and machining requirements.

GS8. Adherence to safety protocols and practices in CNC machining and CAD design environments.

GS9. Willingness to stay updated with new technologies and techniques in CNC machining and CAD design.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Interpret engineering drawings(turning)	**10**	**40**	**-**	**-**
PC1. Interpret engineering drawings and apply to specifications	-	-	-	-
PC2. Locate and identify dimensions of features	-	-	-	-
PC3. Locate and identify surface finish requirements	-	-	-	-
PC4. Locate and identify geometric specifications	-	-	-	-
PC5. Make 3D metal representations of the parts	-	-	-	-
PC6. Identify the materials that parts are made of	-	-	-	-
PC7. Identify critical sequences (with a high possibility of damage or unsafe practice) and develop appropriate approaches	-	-	-	-
NOS Total	**10**	**40**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0456
NOS Name	Interpret engineering drawings(turning)
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
NSQF Level	4.5
Credits	2
Version	1.0
Next Review Date	NA

CSC/N0457: Process planning(turning)

Description

Process planning for turning involves analyzing engineering drawings, selecting machining processes and tools, creating process sheets, and optimizing production for efficiency and quality. This role requires proficiency in reading engineering drawings, knowledge of turning operations, and strong problem-solving skills.

Scope

The scope covers the following :

- The scope of process planning for turning includes analyzing engineering drawings, selecting machining processes and tools, documenting process plans, and continuous improvement of production processes. This role is essential for ensuring the efficient and accurate production of parts in manufacturing environments.

Elements and Performance Criteria

Process planning(turning)

To be competent, the user/individual on the job must be able to:

PC1. Find solutions using the capacities of the workshop environment, and according to the required work (size of batch, complexity)

PC2. Identify the appropriate machining and measuring processes for each feature of each work-piece

PC3. Identify and prepare the best work holding methods

PC4. Identify, prepare, and calibrate appropriate measuring tools

PC5. Identify and prepare appropriate cutting tools

PC6. Identify critical sections (with a high possibility of damage or unsafe practice) and identify alternatives or safe practice to avoid accidents or damage

PC7. Find innovative ways of using the environment to solve technical issues

PC8. Find alternatives which will be reliable until the end of each process

PC9. Weigh each solution and choose the best (considering context, speed, safety, price, and sustainability)

PC10. Make a final choice and lock the strategy accordingly

PC11. Plan the operations and sequences (machining strategy) based on specified data

PC12. Create awareness actions for critical operations where no alternative is available.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. familiarity with standards such as ASME Y14.5 for dimensioning and tolerancing, and ISO 128 for technical drawings.

KU2. Understanding symbols and concepts used to specify geometric characteristics of parts.

KU3. Knowledge of materials properties and various manufacturing methods to ensure designs are feasible and cost-effective.

KU4. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) to create, modify, and interpret technical drawings.

KU5. Ability to understand complex engineering drawings, including views, sections, and annotations.

KU6. Effective communication with engineers, designers, and other stakeholders to clarify specifications and resolve issues.

KU7. Understanding of quality control processes to ensure that final products meet specified requirements.

KU8. Ability to identify and resolve discrepancies between drawings and specifications.

KU9. Thoroughness in reviewing drawings and specifications to ensure accuracy and compliance.

KU10. Awareness of safety standards and regulations relevant to the industry.

KU11. Understanding of cutting tools, feeds and speeds, and machining strategies for CNC turning and milling.

KU12. Knowledge of G-code programming for CNC machines to set up and operate them effectively.

KU13. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) for mechanical design, drafting, and creating detailed drawings.

KU14. Understanding of materials used in manufacturing and their properties to select the appropriate ones for specific applications.

KU15. Knowledge of geometric dimensioning and tolerancing (GD&T) to interpret engineering drawings accurately.

KU16. Awareness of safety standards and regulations relevant to CNC machining and mechanical CAD design.

KU17. Understanding of quality control processes to ensure that manufactured parts meet specifications.

KU18. Ability to troubleshoot issues related to CNC machining, tooling, or CAD designs.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Understanding of machining principles, CAD software, and mechanical systems.

GS2. Precision in machining and CAD design to ensure accuracy of parts and drawings.

GS3. Ability to troubleshoot issues with CNC machines, tooling, or CAD designs.

GS4. Collaboration with engineers, designers, and other team members to achieve project goals.

GS5. Efficient use of time to meet project deadlines and production schedules.

GS6. Effective communication of ideas and requirements with team members and stakeholders.

GS7. Flexibility to work with different materials, designs, and machining requirements.

GS8. Adherence to safety protocols and practices in CNC machining and CAD design environments.

GS9. Willingness to stay updated with new technologies and techniques in CNC machining and CAD design.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Process planning(turning)	**10**	**40**	**-**	**-**
PC1. Find solutions using the capacities of the workshop environment, and according to the required work (size of batch, complexity)	-	-	-	-
PC2. Identify the appropriate machining and measuring processes for each feature of each work-piece	-	-	-	-
PC3. Identify and prepare the best work holding methods	-	-	-	-
PC4. Identify, prepare, and calibrate appropriate measuring tools	-	-	-	-
PC5. Identify and prepare appropriate cutting tools	-	-	-	-
PC6. Identify critical sections (with a high possibility of damage or unsafe practice) and identify alternatives or safe practice to avoid accidents or damage	-	-	-	-
PC7. Find innovative ways of using the environment to solve technical issues	-	-	-	-
PC8. Find alternatives which will be reliable until the end of each process	-	-	-	-
PC9. Weigh each solution and choose the best (considering context, speed, safety, price, and sustainability)	-	-	-	-
PC10. Make a final choice and lock the strategy accordingly	-	-	-	-
PC11. Plan the operations and sequences (machining strategy) based on specified data	-	-	-	-
PC12. Create awareness actions for critical operations where no alternative is available.	-	-	-	-
NOS Total	**10**	**40**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0457
NOS Name	Process planning(turning)
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
NSQF Level	4.5
Credits	3
Version	1.0
Next Review Date	NA

CSC/N0458: Programming (turning)

Description

CNC programming for turning involves interpreting engineering drawings, creating CNC programs using CAM software, selecting cutting tools, optimizing programs for efficiency, and verifying programs through simulation. This role requires proficiency in reading drawings, knowledge of CNC machining, and strong problem-solving skills.

Scope

The scope covers the following :

- The scope of CNC programming for turning includes interpreting engineering drawings, creating and optimizing CNC programs, selecting cutting tools, and verifying programs through simulation. This role is essential for ensuring the accurate and efficient machining of parts on CNC lathes in manufacturing environments.

Elements and Performance Criteria

Programming (turning)

To be competent, the user/individual on the job must be able to:

PC1. Select the best methods according to the production type and part specifications

PC2. Use skill specific software and related hardware

PC3. Generate programs using CAD/CAM systems

PC4. Create or edit programs directly on the machine-control

PC5. Edit running programs in CAD/CAM and reload to the machine-control

PC6. Document any related optimizations and up-load the optimized CNC-Program to the company-server

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. familiarity with standards such as ASME Y14.5 for dimensioning and tolerancing, and ISO 128 for technical drawings.

KU2. Understanding symbols and concepts used to specify geometric characteristics of parts.

KU3. Knowledge of materials properties and various manufacturing methods to ensure designs are feasible and cost-effective.

KU4. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) to create, modify, and interpret technical drawings.

KU5. Ability to understand complex engineering drawings, including views, sections, and annotations.

KU6. Effective communication with engineers, designers, and other stakeholders to clarify specifications and resolve issues.

KU7. Understanding of quality control processes to ensure that final products meet specified requirements.

KU8. Ability to identify and resolve discrepancies between drawings and specifications.

KU9. Thoroughness in reviewing drawings and specifications to ensure accuracy and compliance.

KU10. Awareness of safety standards and regulations relevant to the industry.

KU11. Understanding of cutting tools, feeds and speeds, and machining strategies for CNC turning and milling.

KU12. Knowledge of G-code programming for CNC machines to set up and operate them effectively.

KU13. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) for mechanical design, drafting, and creating detailed drawings.

KU14. Understanding of materials used in manufacturing and their properties to select the appropriate ones for specific applications.

KU15. Knowledge of geometric dimensioning and tolerancing (GD&T) to interpret engineering drawings accurately.

KU16. Awareness of safety standards and regulations relevant to CNC machining and mechanical CAD design.

KU17. Understanding of quality control processes to ensure that manufactured parts meet specifications.

KU18. Ability to troubleshoot issues related to CNC machining, tooling, or CAD designs.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Understanding of machining principles, CAD software, and mechanical systems.

GS2. Precision in machining and CAD design to ensure accuracy of parts and drawings.

GS3. Ability to troubleshoot issues with CNC machines, tooling, or CAD designs.

GS4. Collaboration with engineers, designers, and other team members to achieve project goals.

GS5. Efficient use of time to meet project deadlines and production schedules.

GS6. Effective communication of ideas and requirements with team members and stakeholders.

GS7. Flexibility to work with different materials, designs, and machining requirements.

GS8. Adherence to safety protocols and practices in CNC machining and CAD design environments.

GS9. Willingness to stay updated with new technologies and techniques in CNC machining and CAD design.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Programming (turning)	**40**	**40**	**-**	**-**
PC1. Select the best methods according to the production type and part specifications	-	-	-	-
PC2. Use skill specific software and related hardware	-	-	-	-
PC3. Generate programs using CAD/CAM systems	-	-	-	-
PC4. Create or edit programs directly on the machine-control	-	-	-	-
PC5. Edit running programs in CAD/CAM and reload to the machine-control	-	-	-	-
PC6. Document any related optimizations and up-load the optimized CNC-Program to the company-server	-	-	-	-
NOS Total	**40**	**40**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0458
NOS Name	Programming (turning)
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
NSQF Level	4.5
Credits	3
Version	1.0
Next Review Date	NA

CSC/N0461: Performing metrology and inspection on the workpiece

Description

This NOS involves precise measurement of parts and components to ensure they meet design specifications. It includes using tools like calipers and micrometers to measure dimensions and surface finishes accurately. Quality control is a key aspect, ensuring parts meet specified tolerances and standards. Data analysis is performed to identify trends and variations in the manufacturing process.

Scope

The scope covers the following :

- The scope of metrology includes various industries such as manufacturing, aerospace, automotive, and healthcare. Professionals in roles such as quality control inspectors, metrologists, and manufacturing engineers are involved in metrology. Tasks include performing precise measurements, analyzing measurement data, and ensuring compliance with quality standards. Metrology is essential for ensuring the accuracy, reliability, and safety of products and processes in these industries.

Elements and Performance Criteria

Performing metrology and inspection on the workpiece

To be competent, the user/individual on the job must be able to:

PC1. Select appropriate measuring or gauging instruments

PC2. Calibrate measuring tools

PC3. Use selected tools to make measurements on all features of the products

PC4. The properties, uses, and handling of ferrous and non-ferrous materials

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. familiarity with standards such as ASME Y14.5 for dimensioning and tolerancing, and ISO 128 for technical drawings.

KU2. Understanding symbols and concepts used to specify geometric characteristics of parts.

KU3. Knowledge of materials properties and various manufacturing methods to ensure designs are feasible and cost-effective.

KU4. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) to create, modify, and interpret technical drawings.

KU5. Ability to understand complex engineering drawings, including views, sections, and annotations.

KU6. Effective communication with engineers, designers, and other stakeholders to clarify specifications and resolve issues.

KU7. Understanding of quality control processes to ensure that final products meet specified requirements.

KU8. Ability to identify and resolve discrepancies between drawings and specifications.

KU9. Thoroughness in reviewing drawings and specifications to ensure accuracy and compliance.

KU10. Awareness of safety standards and regulations relevant to the industry.

KU11. Understanding of cutting tools, feeds and speeds, and machining strategies for CNC turning and milling.

KU12. Knowledge of G-code programming for CNC machines to set up and operate them effectively.

KU13. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) for mechanical design, drafting, and creating detailed drawings.

KU14. Understanding of materials used in manufacturing and their properties to select the appropriate ones for specific applications.

KU15. Knowledge of geometric dimensioning and tolerancing (GD&T) to interpret engineering drawings accurately.

KU16. Awareness of safety standards and regulations relevant to CNC machining and mechanical CAD design.

KU17. Understanding of quality control processes to ensure that manufactured parts meet specifications.

KU18. Ability to troubleshoot issues related to CNC machining, tooling, or CAD designs.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Understanding of machining principles, CAD software, and mechanical systems.

GS2. Precision in machining and CAD design to ensure accuracy of parts and drawings.

GS3. Ability to troubleshoot issues with CNC machines, tooling, or CAD designs.

GS4. Collaboration with engineers, designers, and other team members to achieve project goals.

GS5. Efficient use of time to meet project deadlines and production schedules.

GS6. Effective communication of ideas and requirements with team members and stakeholders.

GS7. Flexibility to work with different materials, designs, and machining requirements.

GS8. Adherence to safety protocols and practices in CNC machining and CAD design environments.

GS9. Willingness to stay updated with new technologies and techniques in CNC machining and CAD design.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Performing metrology and inspection on the workpiece	**20**	**30**	**-**	**-**
PC1. Select appropriate measuring or gauging instruments	-	-	-	-
PC2. Calibrate measuring tools	-	-	-	-
PC3. Use selected tools to make measurements on all features of the products	-	-	-	-
PC4. The properties, uses, and handling of ferrous and non-ferrous materials	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0461
NOS Name	Performing metrology and inspection on the workpiece
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
NSQF Level	4.5
Credits	3
Version	1.0
Next Review Date	NA

CSC/N0452: Setting and operating CNC lathes

Description

Setting and operating CNC lathes involves preparing the machine for production, loading materials, and monitoring the machining process. Operators must ensure parts meet quality standards and perform regular maintenance. The role requires attention to detail, the ability to read blueprints, and problem-solving skills. Career opportunities for CNC lathe operators exist in various industries, with potential for advancement into supervisory roles or specialization.

Scope

The scope covers the following :

- The scope of a CNC lathe operator's role includes setting up machines for production, operating them to create parts, and ensuring the quality of finished products. Operators are responsible for maintaining equipment and keeping detailed records of production activities. The role requires attention to detail, technical expertise, and a focus on safety and efficiency.

Elements and Performance Criteria

Setting and operating CNC lathes

To be competent, the user/individual on the job must be able to:

PC1. Follow their selected process strategies
PC2. Appraise and follow a given process-strategy when using External CNC-programs
PC3. Upload generated CNC programs to CNC lathes and perform test runs
PC4. Identify and designate the different machining processes on CNC lathes
PC5. Mount and align selected tools
PC6. Mount and align selected work holding devices
PC7. Mount and align selected accessories (Tailstock, Parts-catcher, etc.)
PC8. Set measures to avoid vibration in machining sequences
PC9. Apply efficient burr-removal techniques on work pieces
PC10. Optimize machining strategies
PC11. Quickly react to problems and emergencies
PC12. Obtain dimensions, geometries, surface roughness etc.
PC13. Make all necessary corrections to get the final part to conform to the blueprint
PC14. Report health, safety, and environmental issues to the appropriate personnel
PC15. Report equipment failures to the appropriate personnel

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. familiarity with standards such as ASME Y14.5 for dimensioning and tolerancing, and ISO 128 for technical drawings.

KU2. Understanding symbols and concepts used to specify geometric characteristics of parts.

KU3. Knowledge of materials properties and various manufacturing methods to ensure designs are feasible and cost-effective.

KU4. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) to create, modify, and interpret technical drawings.

KU5. Ability to understand complex engineering drawings, including views, sections, and annotations.

KU6. Effective communication with engineers, designers, and other stakeholders to clarify specifications and resolve issues.

KU7. Understanding of quality control processes to ensure that final products meet specified requirements.

KU8. Ability to identify and resolve discrepancies between drawings and specifications.

KU9. Thoroughness in reviewing drawings and specifications to ensure accuracy and compliance.

KU10. Awareness of safety standards and regulations relevant to the industry.

KU11. Understanding of cutting tools, feeds and speeds, and machining strategies for CNC turning and milling.

KU12. Knowledge of G-code programming for CNC machines to set up and operate them effectively.

KU13. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) for mechanical design, drafting, and creating detailed drawings.

KU14. Understanding of materials used in manufacturing and their properties to select the appropriate ones for specific applications.

KU15. Knowledge of geometric dimensioning and tolerancing (GD&T) to interpret engineering drawings accurately.

KU16. Awareness of safety standards and regulations relevant to CNC machining and mechanical CAD design.

KU17. Understanding of quality control processes to ensure that manufactured parts meet specifications.

KU18. Ability to troubleshoot issues related to CNC machining, tooling, or CAD designs.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Understanding of machining principles, CAD software, and mechanical systems.

GS2. Precision in machining and CAD design to ensure accuracy of parts and drawings.

GS3. Ability to troubleshoot issues with CNC machines, tooling, or CAD designs.

GS4. Collaboration with engineers, designers, and other team members to achieve project goals.

GS5. Efficient use of time to meet project deadlines and production schedules.

GS6. Effective communication of ideas and requirements with team members and stakeholders.

GS7. Flexibility to work with different materials, designs, and machining requirements.

GS8. Adherence to safety protocols and practices in CNC machining and CAD design environments.

GS9. Willingness to stay updated with new technologies and techniques in CNC machining and CAD design.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Setting and operating CNC lathes	**30**	**70**	**-**	**-**
PC1. Follow their selected process strategies	-	-	-	-
PC2. Appraise and follow a given process-strategy when using External CNC-programs	-	-	-	-
PC3. Upload generated CNC programs to CNC lathes and perform test runs	-	-	-	-
PC4. Identify and designate the different machining processes on CNC lathes	-	-	-	-
PC5. Mount and align selected tools	-	-	-	-
PC6. Mount and align selected work holding devices	-	-	-	-
PC7. Mount and align selected accessories (Tailstock, Parts-catcher, etc.)	-	-	-	-
PC8. Set measures to avoid vibration in machining sequences	-	-	-	-
PC9. Apply efficient burr-removal techniques on work pieces	-	-	-	-
PC10. Optimize machining strategies	-	-	-	-
PC11. Quickly react to problems and emergencies	-	-	-	-
PC12. Obtain dimensions, geometries, surface roughness etc.	-	-	-	-
PC13. Make all necessary corrections to get the final part to conform to the blueprint	-	-	-	-
PC14. Report health, safety, and environmental issues to the appropriate personnel	-	-	-	-
PC15. Report equipment failures to the appropriate personnel	-	-	-	-
NOS Total	**30**	**70**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0452
NOS Name	Setting and operating CNC lathes
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
NSQF Level	4.5
Credits	2
Version	1.0
Next Review Date	NA

CSC/N0453: Finalize and deliver work pieces

Description

The role of finalizing and delivering workpieces involves inspecting them for quality, performing finishing operations, and packaging them securely. Operators coordinate with shipping teams to ensure timely delivery and maintain detailed records of their activities. This role requires attention to detail, knowledge of finishing techniques, and strong organizational skills.

Scope

The scope covers the following :

- The scope of finalizing and delivering workpieces includes inspecting for quality, performing finishing tasks, and packaging items securely. Operators also coordinate with shipping teams for timely delivery and maintain detailed records of their activities. This role demands attention to detail, knowledge of finishing techniques, and strong organizational skills.

Elements and Performance Criteria

Finalize and deliver work pieces

To be competent, the user/individual on the job must be able to:

PC1. Clean and deburr products

PC2. Make final optical and measurement checks

PC3. Deliver parts, drawings and digital memory devices to the appropriate locations and/or personnel as required by the organization

PC4. Dismount tools, clamping devices and machine accessories

PC5. Clean the machine and workplace

PC6. Set each environment to their initial state, ready for the next job

PC7. Document and save CNC Programs, work-holding and tooling information etc. for each organization’s re-use of a production

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. familiarity with standards such as ASME Y14.5 for dimensioning and tolerancing, and ISO 128 for technical drawings.

KU2. Understanding symbols and concepts used to specify geometric characteristics of parts.

KU3. Knowledge of materials properties and various manufacturing methods to ensure designs are feasible and cost-effective.

KU4. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) to create, modify, and interpret technical drawings.

KU5. Ability to understand complex engineering drawings, including views, sections, and annotations.

KU6. Effective communication with engineers, designers, and other stakeholders to clarify specifications and resolve issues.

KU7. Understanding of quality control processes to ensure that final products meet specified requirements.

KU8. Ability to identify and resolve discrepancies between drawings and specifications.

KU9. Thoroughness in reviewing drawings and specifications to ensure accuracy and compliance.

KU10. Awareness of safety standards and regulations relevant to the industry.

KU11. Understanding of cutting tools, feeds and speeds, and machining strategies for CNC turning and milling.

KU12. Knowledge of G-code programming for CNC machines to set up and operate them effectively.

KU13. Proficiency in using CAD software (e.g., AutoCAD, SolidWorks) for mechanical design, drafting, and creating detailed drawings.

KU14. Understanding of materials used in manufacturing and their properties to select the appropriate ones for specific applications.

KU15. Knowledge of geometric dimensioning and tolerancing (GD&T) to interpret engineering drawings accurately.

KU16. Awareness of safety standards and regulations relevant to CNC machining and mechanical CAD design.

KU17. Understanding of quality control processes to ensure that manufactured parts meet specifications.

KU18. Ability to troubleshoot issues related to CNC machining, tooling, or CAD designs.

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Understanding of machining principles, CAD software, and mechanical systems.

GS2. Precision in machining and CAD design to ensure accuracy of parts and drawings.

GS3. Ability to troubleshoot issues with CNC machines, tooling, or CAD designs.

GS4. Collaboration with engineers, designers, and other team members to achieve project goals.

GS5. Efficient use of time to meet project deadlines and production schedules.

GS6. Effective communication of ideas and requirements with team members and stakeholders.

GS7. Flexibility to work with different materials, designs, and machining requirements.

GS8. Adherence to safety protocols and practices in CNC machining and CAD design environments.

GS9. Willingness to stay updated with new technologies and techniques in CNC machining and CAD design.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Finalize and deliver work pieces	**20**	**30**	**-**	**-**
PC1. Clean and deburr products	-	-	-	-
PC2. Make final optical and measurement checks	-	-	-	-
PC3. Deliver parts, drawings and digital memory devices to the appropriate locations and/or personnel as required by the organization	-	-	-	-
PC4. Dismount tools, clamping devices and machine accessories	-	-	-	-
PC5. Clean the machine and workplace	-	-	-	-
PC6. Set each environment to their initial state, ready for the next job	-	-	-	-
PC7. Document and save CNC Programs, work-holding and tooling information etc. for each organization’s re-use of a production	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	CSC/N0453
NOS Name	Finalize and deliver work pieces
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
NSQF Level	4.5
Credits	1
Version	1.0
Next Review Date	NA

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the theory part will be based on the knowledge bank of questions created by the SSC.

3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

4. Individual assessment agencies will create unique question papers for the theory part for each candidate at each examination/training centre (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria.

6. To pass the Qualification Pack assessment, every trainee should score a minimum of 70% of % aggregate marks to successfully clear the assessment.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CSC/N0455.Work organization and management (turning)	20	30	-	-	50	5
CSC/N0456.Interpret engineering drawings(turning)	10	40	-	-	50	10
CSC/N0457.Process planning(turning)	10	40	-	-	50	10
CSC/N0458.Programming (turning)	40	40	-	-	80	10
CSC/N0461.Performing metrology and inspection on the workpiece	20	30	-	-	50	5
CSC/N0452.Setting and operating CNC lathes	30	70	-	-	100	55
CSC/N0453.Finalize and deliver work pieces	20	30	-	-	50	5
Total	**150**	**280**	**-**	**-**	**430**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.