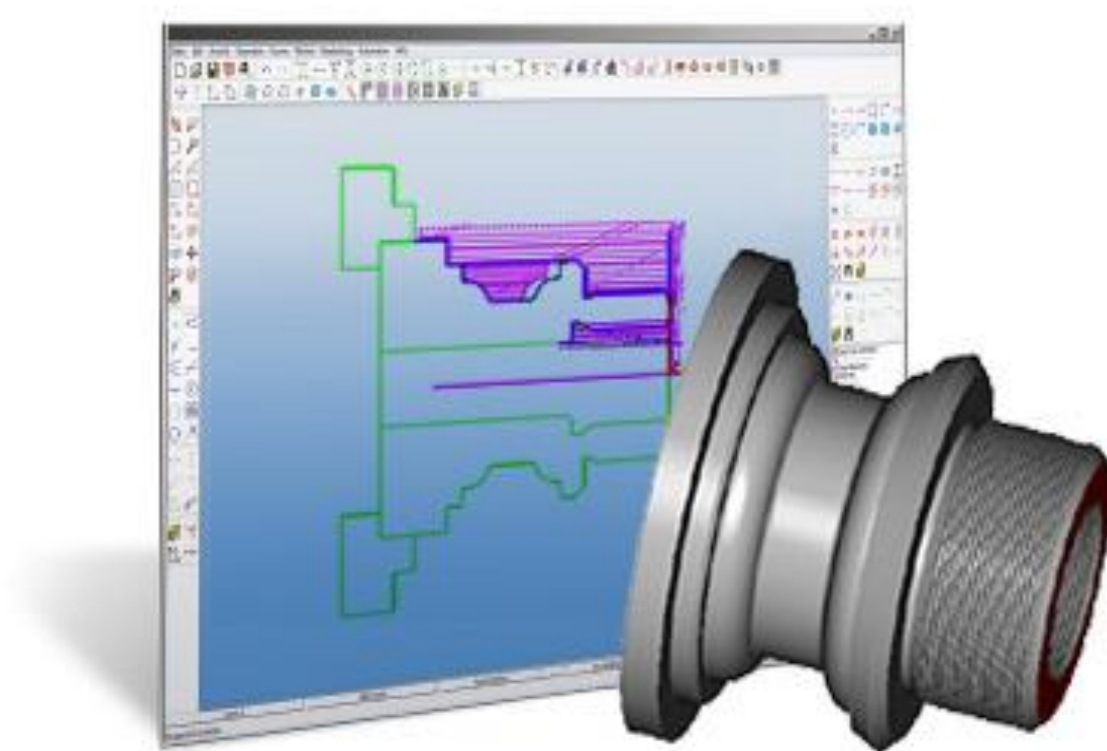




Model Curriculum

QP Name: Assistant CAM Programmer (CNC Lathe)

QP Code: QG-03-CG-05927-2025-V2-KSDC

QP Version: 2.0

NSQF Level: 3.0

Model Curriculum Version: 2.0

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Training Parameters

Sector	Capital Goods and Manufacturing
Sub-Sector	
Occupation	
Country	India
NSQF Level	3
Aligned to NCO/ISCO/ISIC Code	7223.5001 Machining Technician/CNC Operator 7223.6001 CNC Setter-cum-Operator – Turning 7223.6003 CNC Programmer
Minimum Educational Qualification and Experience	Grade 10 pass OR Grade 8 pass with two years of (NTC/ NAC) after 8th OR 9th Grade pass with 1.5 -year relevant experience OR 8th Grade pass with 3 -year relevant experience OR 5th grade pass with 7.5-year relevant experience OR Previous relevant Qualification of NSQF Level 2.5 with 1.5-year relevant experience OR Previous relevant Qualification of NSQF Level 2 with 1.5-year relevant experience
Pre-Requisite License or Training	N/A
Minimum Job Entry Age	15 Years
Last Reviewed On	16 th June 2022
Next Review Date	
NSQC Approval Date	
QP Version	1.0
Model Curriculum Creation Date	26 th June 2025
Model Curriculum Valid Up to Date	
Model Curriculum Version	1.0
Minimum Duration of the Course	300 Hours
Maximum Duration of the Course	300 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 will be able to:

- Comply with workshop health and safety guidelines
- Understand and apply principles of basics of engineering design, mathematics, system of Measuring, Measurements and Tools, Machining, various types of material used in industries.
- Understand the Manufacturing Drawings, GD&T, Engineering Materials, Manufacturing Processes. Importance of Quality in Manufacturing.
- Use of Cutting Tools and Tool Holders Cutting Speeds, Feeds and Revolutions Per Minute, Understand Chip Formation, Chip Load, and Material Removal Rate, work Holding and Setup.
- CAM software user interface, understanding of G codes and M codes, CAM software features, setting up a CAM program, Tool path generation. Simulate and NC part program.
- Tool path generation on various components using engineering drawing with GD&T
- Prove out CNC lathe part program and inspection of machined components using measuring instruments

Compulsory Modules

The table lists the modules, their duration, and mode of delivery.

NOS/Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total
Module 1: Comply with workshop health and safety guidelines	5	0			5
Module 2: Understand and apply principles of Basics of Engineering Design, Mathematics, system of measurements, Measurements and Tools, Machining, various types of material used in industries.	5	5			10
Module 3: Understand the Manufacturing Drawings, GD&T, Engineering Materials, Manufacturing Processes. Importance of Quality in Manufacturing.	5	10			15
Module 4: Use of Cutting Tools and Tool Holders Cutting Speeds, Feeds and Revolutions Per Minute, Understand Chip Formation, Chip Load, and Material Removal Rate, work Holding and Setup.	10	20			30
Module 5: CAM software user interface, understanding of G codes and M codes, CAM software features, setting up a CAM program, Tool path generation. Simulate and NC part program.	10	20			30
Module 6: Tool path generation exercise on various components using engineering drawing with GD&T	10	20			30
Module 7: Prove out CNC lathe part program and inspection of machined components using measuring instruments.	10	20			30
Module 8: Assignments	10	20			30
Module 9: OJT (Mini Project (Based on Industrial application))			90		90
Module 10: Employability Skills	10	20			30
Duration (in Hours) / Total Marks	75	135	90		300

Module Details

Module 1: Comply with workshop health and safety guidelines

Terminal Outcomes:

- Identify safety equipment's.
- Demonstrate use of safety equipment

Duration: 05:00	Duration: 00:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Fire Extinguishers & its Types • Safely handling Tools & Equipment • Use of proper Tools & Equipment & its maintenance • OSH & practices to be observed as a precaution	• Fire Fighting in workplace & Precautions • General Safety of Tools & Equipment • Awareness on OSH related to the job
Classroom Aids	
Whiteboard, Markers, Duster, Projector, Laptop, Presentation	
Tools, Equipment, and Other Requirements	
Safety equipments	

Module 2: Understand and apply principles of Basics of Engineering Design, Mathematics, system of measurements, Measurements and Tools, Machining, various types of material used in industries.

Terminal Outcomes:

- Understand the engineering drawing
- Inspect the component using measuring instruments.

Duration: 05:00	Duration: 05:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Introduction to engineering drawing • First and third angle projection method. • Types of line and dimensions • Introduction to mathematics (Unit and its conversion.) • Introduction to measuring system. • Importance of calibration of measuring instruments. • Orientation and standard operating procedure for measuring instruments. • Introduction to manufacturing process • Importance of machining components and various types of machining. • Orientation of tools used for CNC Turning machine. • Introduction to industrial materials and its properties (Chemical, Mechanical, Thermal, etc.) • Impact of work piece material for machining and its tooling.	• Identify the projection method. • Create the missing view. • Calculate the basic calculation (Addition, Subtraction, etc.) • Calculate the Fractions, Decimals, units. • Conversion of units like CM to MM and Inch to MM, etc. • Inspect the sample component by using various measuring instruments like Vernier Calipers, Micrometer, Height Gauge, etc. • identify the operation performed on sample component. (Drilling, Reaming, Tapping, Turning, facing, grooving, parting, Threading.) • Identify the different materials available in workshop.
Classroom Aids	
Templates, Presentations, Whiteboard, Marker, Projector, Laptop, Participant Handbook	
Tools, Equipment and Other Requirements	
Workstation / Computer, Measuring and inspection instruments, etc.	

Module 3: Understand the manufacturing drawings, GD&T, manufacturing processes, and recognize the importance of quality in manufacturing.

Terminal Outcomes:

- Understand the manufacturing drawing
- Understand the GD & T and its importance.

Duration: 05:00	Duration: 10:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Introduction to manufacturing drawing. • Introduction to limit, Fit and tolerance. • Concept of GD & T and its importance. • Concept of feature control frames, datums, and tolerance zones. • Types of surface finish and symbols • Introduction to manufacturing processes and different types of manufacturing. • Importance of machining in manufacturing processes and different types of machining processes. • Orientation of different machines used for machining process. • Introduction to key manufacturing note and machining symbols. • Importance of quality in manufacturing. • Standard operating procedure to use measuring tools and equipment's (calipers, micrometers, CMMs) and their applications.	• Create a check list manufacturing drawing. • Identify the manufacturing key symbols, dimensions, and tolerances from manufacturing drawing. • Create a checklist of manufacturing drawing requirement. (Dimension, tolerance, GD & T, Notes, etc.) • Identify the manufacturing processes used in sample part available in workshop. • Measure the sample component using vernier calipers, micrometer, etc. • Identify the various operations like boring, turning, threading etc.
Classroom Aids	
Training kit (Trainer guide, Presentations), Whiteboard, Marker, Projector, Laptop, Participant Handbook,	
Tools, Equipment, and Other Requirements	
Workstation / Computer, Measuring and inspection instruments, etc	

Module 4: Use of Cutting Tools and Tool Holders Cutting Speeds, Feeds and Revolutions Per Minute, Understand Chip Formation, Chip Load, and Material Removal Rate, work Holding and Setup.

Terminal Outcomes:

- Identify the cutting tools used in lathe machine
- Understand the importance of work piece holding setup.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Introduction to cutting tools and its nomenclature • Types of tool holders and its nomenclature. • Concept and importance of Cutting Speeds, • Concept and importance of cutting feeds rate. • Concept of Material removal and chip Formation • Introduction to Jigs and Fixture.	• Identify the cutting tools and its type • Identify the tool holder and practice to load tool in tool holder. • Select or replace worn out cutting tool. • Calculate the cutting Speed and Feed. • Calculate the material removal rate and cutting time calculations.
Classroom Aids	
Training kit (Trainer guide, Presentations), Whiteboard, Marker, Projector, Laptop, Participant Handbook,	
Tools, Equipment and Other Requirements	
Safety kit, workstation, CAM software, simulator, CNC machine Compressor, Cutting tools, etc.	

Module 5: CAM software user interface, understanding of G codes and M codes, CAM software features, setting up a CAM program, Tool path generation. Simulate and NC part program.

Terminal Outcomes:

- Understand the user interface of CAM software.
- Understand the CNC machine G code and M Code.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Introduction to Computer Aided Manufacturing. (CAM) • Importance of Computer Aided Manufacturing (CAM) • Orientation of various CAM software used in industry and their features. • Orientation of CAM software and user interface of software. • Orientation of setting option in CAM software • Orientation of 2D and 3D model creation tool in CAM software. • Introduction to G Code and M code used in CNC lathe machine. • Concept of stock setup. • Concept of machine chuck and its types. • Concept of Rough cut and finish cut • Importance of tool path verification and its impact on machining cycle time. • CAM Tool library and manager orientation.	• Launch CAM software. • Perform UI settings. • Create a 2D model for step turning operation. • Create 3D model for step turning machining. • Set up the machine definition and control definition for your CNC lathe in CAM software. • Define Geometry -Use Wireframe tools to draw the 2D profile of the part (step turning shape). • Setup stock and define chuck parameters. • Select proper tools from tool library. • Define speed, feed and depth of cut. • Perform roughing operation and simulate the tool path • Generate the NC Part program.
Classroom Aids	
Training kit (Trainer guide, Presentations), White board, Marker, Projector, Laptop, Presentation, Participant Handbook and Related Standard Operating Procedures	
Tools, Equipment and Other Requirements	
Industrial workstation, CAM software, etc.	

Module 6: Tool path generation exercise on of various components using engineering drawing with GD&T

Terminal Outcomes:

- Able to read the engineering drawing and understand the GD & T
- Able to generate the tool path in CAM software.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Reading of manufacturing drawing. • Orientation of symbols used in manufacturing drawing like surface finish and GD & T. • Concept of production planning and control. • Orientation of various Lathe operations and tooling required to perform the operation. • Concept of roughing and finishing operation. • Importance of speed, feed and depth of cut as per roughing and finishing operation. • Concept of import and export the NC file.	• Create a check list of part geometry, material, tolerances, • Make check list of engineering drawing requirement. • Identify the name of machining operation required. • Select the machine according to the operation. • Identify and define the machining process flow. (Setup 1 , Setup 2 like) • Open the CAM software and perform basic UI settings. • Define or create the geometry inside the software. • Import geometry. • Perform stock setup and Chuck jaw clearance. • Perform roughing operation. • Select the tool from tool library. • Create and modify the tool in library. • Set parameters like depth of cut, feed rate, and spindle speed. • Select the tool path for operation. • Select the finish setup by selecting tools and path of tool to travel. • Verify or Backplot simulate the tool path. • Generate the NC code (G – Code) • Save the NC file • Export the NC code to machine.
Classroom Aids	
Training kit (Trainer guide, Presentations), White board, Marker, Projector, Laptop, Presentation, Participant Handbook and Related Standard Operating Procedures	
Tools, Equipment and Other Requirements	
Industrial workstation, CAM software, etc.	

Module 7: Prove out CNC lathe part program and inspection of machined components using measuring instruments.

Terminal Outcomes:

- Understand the program structure and syntax for CNC turning machine.
- Select, edit and create the program for CNC turning machine.
- Able to use CNC Simulator to optimize the cycle time.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Standard operating procedure for CNC turning machine. • Introduction to the CNC turning machine operation • Tools used for different turning operations. • Structure of CNC turning machine program. • Syntax of CNC turning machine program • Introduction to various G code and M Code as per the available machine in workshop. • Tool selection and tool offset for CNC Turing machine. • Guidelines for define speed, feed and depth of cut, • Overview of common programming errors (missing codes, syntax issues) and how to troubleshoot them. • User interface of CNC simulator. • Concept of cycle time. • Machine Maintenance and its types.	• Generate the step turning program on CAM software. • Export the NC file from software. • Verify the generated NC part program and verify syntax and logic. • Load tools into the turret and set tool offsets using a tool setter or manual touch-off. • Workpiece Setup • Mount the raw material securely in the chuck and set the work coordinate zero. • Dry Run Execution • Execute or run the program in air (without cutting) to check for toolpath errors or collisions. • Execute or run program in Single Block Mode • Execute the program line-by-line to observe each movement and verify correctness. • Perform the machining operation with coolant and proper cutting parameters. • Perform dimensional inspection • Measure dimensions using calipers, micrometers, and height gauges. • Record all measurements and compare them with design tolerances.
Classroom Aids	
Training kit (Trainer guide, Presentations), White board, Marker, Projector, Laptop, Presentation, Participant Handbook and Related Standard Operating Procedures	
Tools, Equipment and Other Requirements	
Industrial workstation, CAM Software, CNC Turning Centre, Compressor, cutting tools, Measuring and inspection instruments live vernier caliper, micrometer, etc..	

Module 8 : Assignments (Based on case studies and Industrial application)

Terminal Outcomes:

- Ability to work as a CAM programmer for CNC lathe machine.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Assignments based on live problems	• Assignments based on live problems
Classroom Aids	
Training kit (Trainer guide, Presentations), White board, Marker, Projector, Laptop, Presentation, Participant Handbook and Related Standard Operating Procedures	
Tools, Equipment and Other Requirements	
Industrial workstation, CAM software, CNC simulator, CNC machine, inspection instruments etc.	

Module 9: OJT (Mini Project - Based on Industrial application)

Terminal Outcomes:

- Ability to work as a CAM programmer for CNC lathe machine.

Duration: 30:00	Duration: 60:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• OJT • Machine safety guidelines • Understand the G code & M Code	• OJT • Reading / understanding Drawing with GD&T. • Able to create 2D and 3D model in CAM software. • Generate the NC code for CNC turning machine by using CAM software.
Classroom Aids	
Training kit (Trainer guide, Presentations), White board, Marker, Projector, Laptop, Presentation, Participant Handbook and Related Standard Operating Procedures	
Tools, Equipment and Other Requirements	
Industrial workstation, CAM software, etc.	

Module 10: Employability Skills

Terminal Outcomes:

- Understanding the Significance of Employability skills
- Identification the Constitutional values
- Explaining Becoming a professional in the 21st century
- Speak with Others in Basic English skills
- Significance of Career development and goal setting
- Etiquette of Communication skills
- Use Various Financial and legal literacy
- Awareness to Essential Digital Skills

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
• Develop employability skills such as • Critical thinking • Creativity • Problem-solving • Communication • Collaboration • Adaptability	• Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette • Utilize virtual collaboration tools to work effectively • Demonstrate how to maintain hygiene and dressing appropriately. • Resume building • Perform a mock interview
Classroom Aids	
Training kit (Trainer guide, Presentations), Whiteboard, Marker, Projector, Laptop, Participant Handbook	
Tools, Equipment and Other Requirements	
Training kit (Trainer guide, Presentations), Whiteboard, Marker, Projector, Laptop, Participant Handbook	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Academic Experience		Remarks
		Years	Specialization	Years	Specialization	
Graduate in Engineering		Graduate in Engineering with 2-year experience in relevant field				

Trainer Certification	
Domain Certification	Platform Certification

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	Specialization	Relevant Industry Experience		Academic Experience		Remarks
		Specialization	Years	Specialization	Specialization	
Graduate in Engineering		Graduate in Engineering with 4-year experience in relevant field.				

Assessor Certification	
Domain Certification	Platform Certification

Assessment Strategy

This section includes the processes involved in identifying, gathering and interpreting information to evaluate the learner on the required competencies of the program.

1. Assessment System Overview:
 - Batches assigned to the assessment agencies for conducting the assessment on SDSM/SIP or email
 - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
 - Assessment agency deploys the ToA certified Assessor for executing the assessment SSC monitors the assessment process & records
 - If the batch size is more than 30, then there should be 2 Assessors.
2. Testing Environment: Assessor must:
 - Confirm that the centre is available at the same address as mentioned on SDMS or SIP Check the duration of the training.
 - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
 - 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 should be verified by the other subject Matter Experts along with the approval required from THSC
 - Questions are mapped with NOS and PC
 - Question papers are prepared considering that level 1 to 3 is for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
 - Assessor must be ToA certified
 - Assessment agency must follow the assessment guidelines to conduct the assessment

-
- 4. Types of evidence or evidence-gathering protocol:
 - Time-stamped & geotagged reporting of the assessor from assessment location
 - Centre photographs with signboards and scheme specific branding
 - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
 - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos
- 5. Method of verification or validation:
 - Surprise visit to the assessment location
 - Random audit of the batch
 - Random audit of any candidate
- 6. Method for assessment documentation, archiving, and access
 - Hard copies of the documents are stored
 - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage and are stored in the Hard Drives

References

Glossary

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

Acronyms and Abbreviations

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
TVET	Technical and Vocational Education and Training
SOP	Technical and Vocational Education and Training
OH&S	Occupational Health and Safety
PPE	Personal Protective Equipment
HACCP	Hazard Analysis and Critical Control Points
FSSAI	Food Safety and Standards Authority of India
ISO	International Standards Organization
IPR	Intellectual Property Rights